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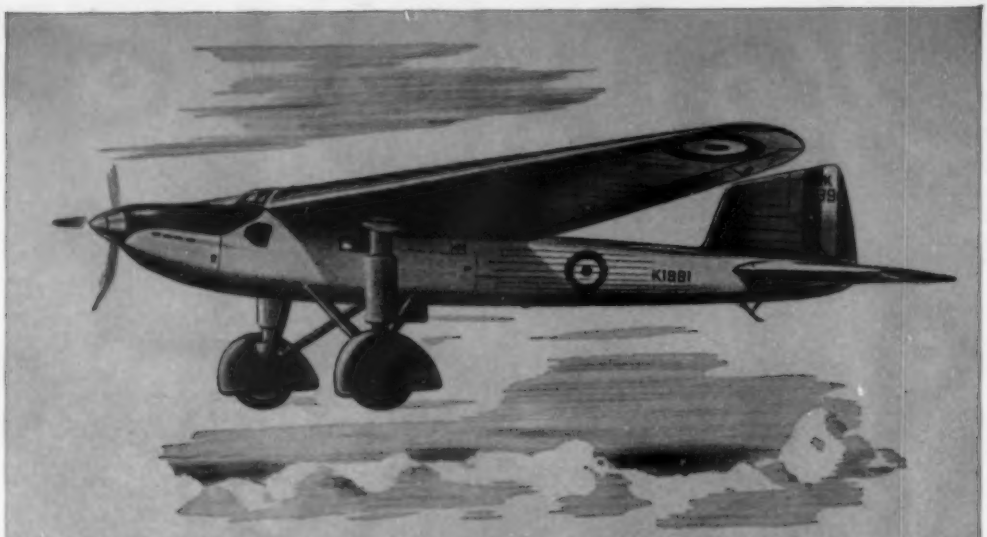

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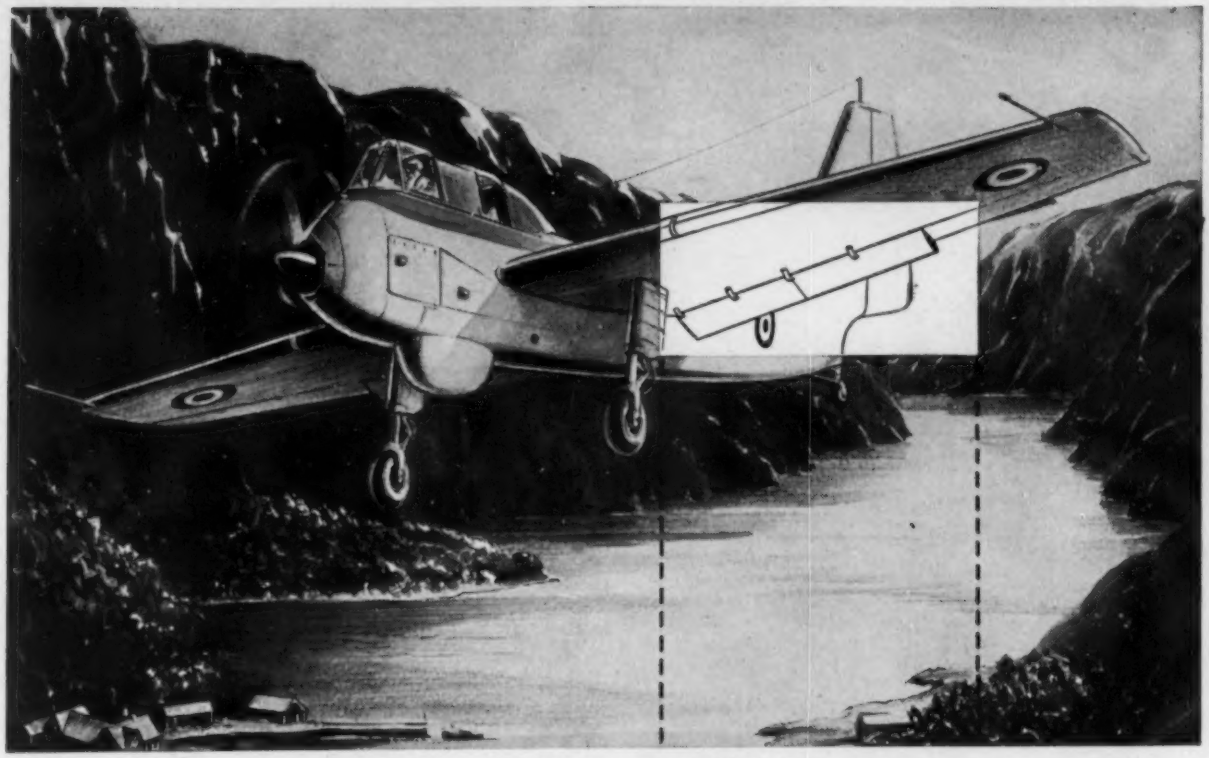

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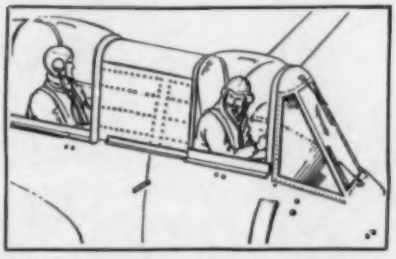

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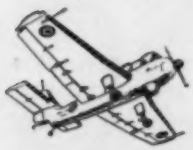

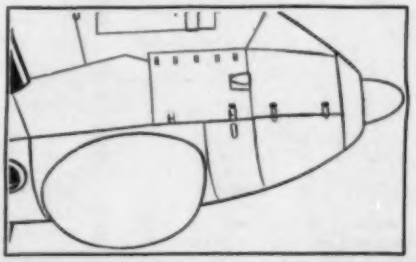

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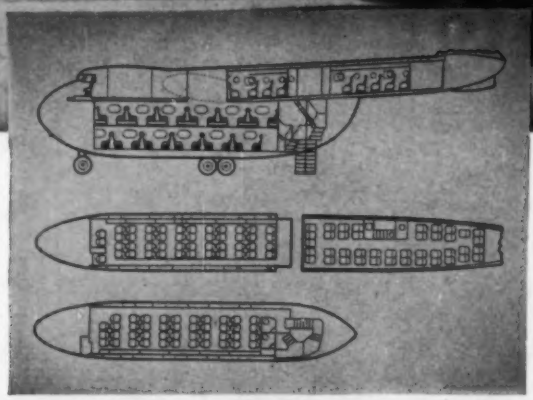

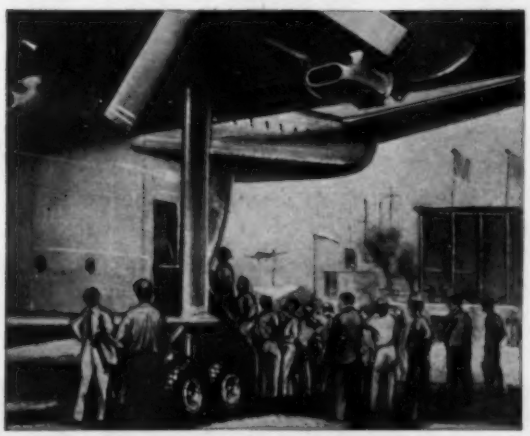

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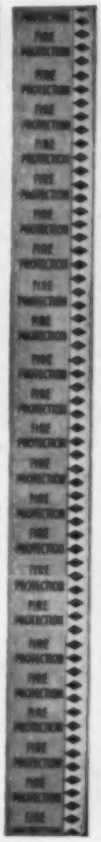

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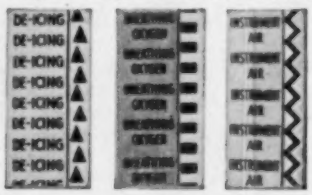

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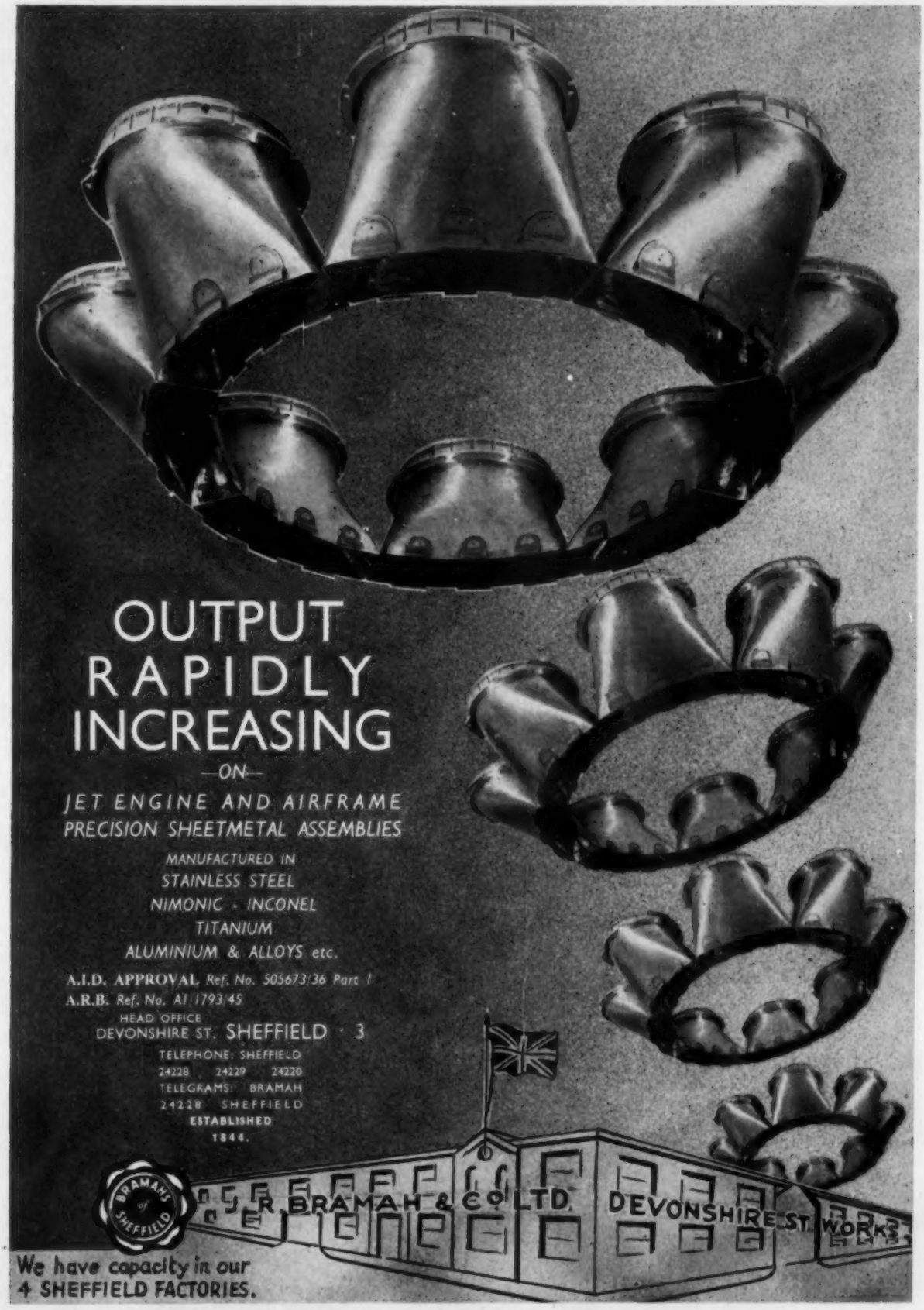
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First Aeronautical Weekly in the World

Founded 1909

No. 2384 Vol. 66. FRIDAY, 1 OCTOBER 1954

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MAURICE A. SMITH, D.F.C.

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Editorial, Advertising and Publishing Offices:

DORSET HOUSE,
STAMFORD STREET,
LONDON, S.E.1.

Telegrams, Flightpres, Sedist, London.
Telephone, Waterloo 3333 (60 lines).

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IN THIS ISSUE:

"Albion" at Work - - - 508
Battle Royal - - - - - - 510
French Ultra-lights - - - 513
Sino-Soviet Tour - - - - 516
For Agriculture and Forestry 517
"Collision Course" Air Interception 518
Of the New Generation 519
Under Three Flags - - - 522
M.o.S. Technical Contributions 523
"Operation Elba Isle" - 524
Antarctic Air Exploration 525
International Sociability 529

Helicopters Down to Earth

LATELY the public seems suddenly to have been making up its mind—or, perhaps, leaping to conclusions—on the subject of helicopters. The reason, without doubt, is that rotating-wing aircraft have been making news almost daily: they have performed some remarkable feats of coastal rescue, they have flown various trial services, including one from the Continent, they have been demonstrated before tens of thousands of people at Farnborough, and a good deal has been said about them by B.B.C. speakers.

Alas, the resultant surge of optimism, as it has been called by one authority, will, we fear, lead to some dashed hopes. The great public has not yet fully absorbed another lesson it is in process of learning: namely, that new aeroplanes need years and years to propagate themselves from the germ of a designer's idea into an operational epidemic.

Yet, provided we keep our hopes in perspective, there are good reasons for looking forward to a great future for whirly-birds in this country. It is scarcely necessary to repeat the reasons for believing that helicopters are particularly suited to many British air transport needs. The short distances between cities, the overall built-up nature of the heavily populated counties and the near impossibility of providing sufficient and adequate runways: these factors will be recognized, as may British weather and its poor visibility, which seem likely to affect helicopters rather less than other types of aircraft. Add to these considerations a slow and dated mainline railway system and overcrowded and wholly inadequate roads, and it is possible to appreciate the reasons for the helicopter's already considerable public appeal. Fortunately the inevitably long development period for the first "rotorliner" can be expected to be as seconds in comparison with that which will be needed for the large-scale modernization of alternative modes of transport.

At the same time, it is as well to know what one is up against and what the helicopter is and is not suited for. There has, for instance, been much talk about helicopter taxis or helibuses to link airports with city centres; yet this seems likely to prove one of the least economical and least satisfactory applications for many years to come. Again, when rotorliners are economically employed on city-to-city services with stage-lengths of up to about 200 miles, the whole purpose will be lost and the effort wasted unless they are enabled to operate from convenient central stops in the cities. Frequent and reliable services, as well as quick and reasonably cheap ones, will also be necessary if full advantage is to be taken of short-stage air transport. A start may perhaps be made by 1960.

In his recent "A to Z" speech to guests and members of the S.B.A.C., the Minister of Supply made a pertinent remark regarding noise: he said that the public expected civil aircraft to behave in a civil manner. We entirely agree. Commercial helicopters will be landing and taking off in very close proximity to working and sleeping civilians; so, ideally, they should be seen but not heard.

We stress that we are here considering services which are expected to materialize some five or ten years hence. Now is the time (it is already late, in fact) to plan and prepare not only the helicopters but the platforms from which they can operate and the services upon which they can best make a start.

In the intervening period newer helicopters of American design will probably continue uneconomically to carry out trial services in succession to the early two-, three- and four-seaters used to date. The only British commercial design of medium size the construction of which is known to be proceeding—the promising Rotodyne—will, it is hoped, make its first flight next year. Progress may be delayed, however, should military work divert some of the brains and hands engaged on it. We do not know how seriously to take the model of the Sikorsky S-56 displayed in B.E.A. colours at Farnborough. Its presence implies its inclusion in Westland licensing agreements; it is almost certainly the most promising twin-piston-engined design for civil transport work now flying. A development may have more wing and, possibly, forward-propulsion airscrews. The civil variant is only a design at present, but the differences should not be extensive.

The time factor well understood, civil rotorcraft can safely be accorded a bright future. In this future we would not include as a permanent fixture the transportation of passengers from existing international airports to city centres. This major problem should be placed firmly back in the lap of the newly-appointed Minister of joint transportation.

FROM ALL QUARTERS

WITH 2ND A.T.A.F.: The first Canberra squadron of the R.A.F. to be permanently based in Germany is No. 149, commanded by S/L. R. E. R. Adams, and now operating from Gutersloh, in the neighbourhood of which this "Flight" photograph was secured last week. The aircraft are Canberra B.2s of various vintages, though it may be supposed that units of this kind will eventually receive the B.8 intruder.

Britannia's First Flight Overseas

PHASE ONE of the Bristol Britannia's hot-weather take-off and landing trials, an essential part of the C. of A. programme, should be well under way by the time this issue of *Flight* appears. The first prototype, G-ALBO, flew from Filton to Idris, Tripoli, on Saturday, carrying a total of 29 people from the manufacturers, B.O.A.C. and the A.R.B. Its average speed for the 1,600-mile journey was 320 m.p.h.

Throughout the flight G-ALBO was in touch with the telecommunications centre at Birdlip, Gloucester. Taking off at 10.30 a.m. B.S.T., it was at 23,500ft over the French coast by 11.10 a.m. The next message was received at 12.53, when the Britannia was 15 miles east of Nice, at 25,500ft. At 2.7 p.m. the aircraft was off the south-east tip of Sardinia, and half-an-hour later was reported off Tunis. At 3 p.m. the aircraft was nearing destination, and half-an-hour later the radio operator reported that the Idris airfield was in sight. Later in the afternoon came a message from the Idris control, saying that the Britannia had touched down at 3.37 p.m. On Monday the company received a cable from Mr. Pegg (portrait on opposite page) saying "All O.K."

Bombers, Conventional and Otherwise

THE problems of bomber design were enumerated by Mr. D. Keith-Lucas, B.A., chief engineer, Short Brothers and Harland, Ltd., when he presented the eleventh quadrennial Gustave Canet memorial lecture before the Junior Institution of Engineers on Friday last. The lecture was given at the new headquarters of the Institution at Pepys House, Rochester Row, Westminster, which had been opened the previous day by Viscount Falmouth.

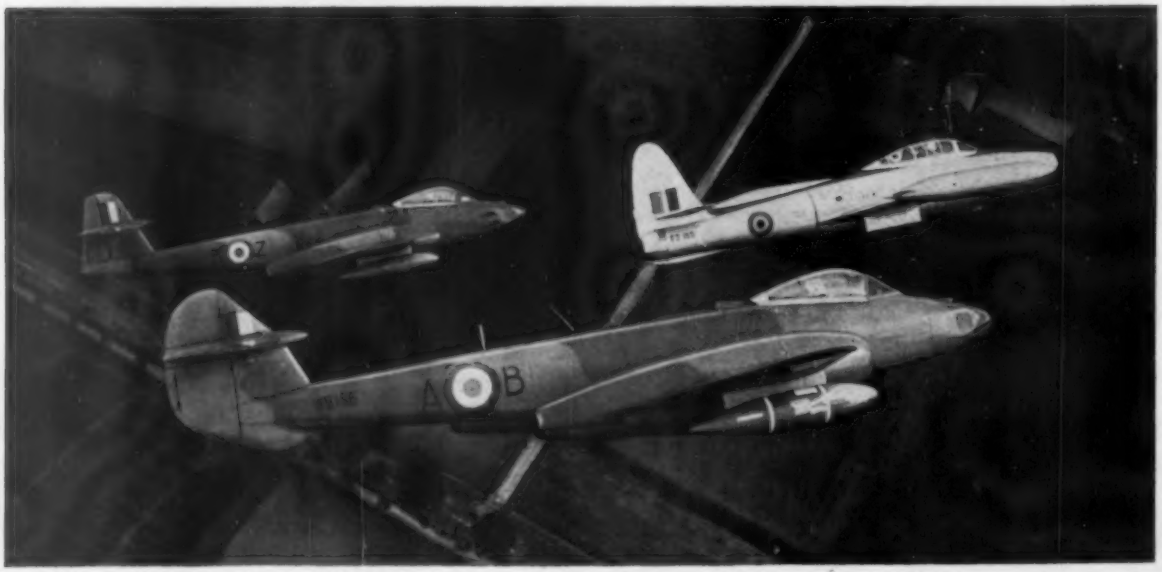
Mr. Keith-Lucas first outlined the historical development of the bomber during the two World Wars. He went on to deal in turn with the specific qualities and problems of penetrating power, vulnerability, armament, altitude and manœuvrability, and to discuss the various aspects of low-altitude, supersonic and pilotless bombers. Although the penetrating power of the long-range rocket would be outstanding, he thought this type of bombing was unsuitable for ranges of more than about 750 miles. For longer ranges, he maintained, the more conventional types of bomber would still be needed.

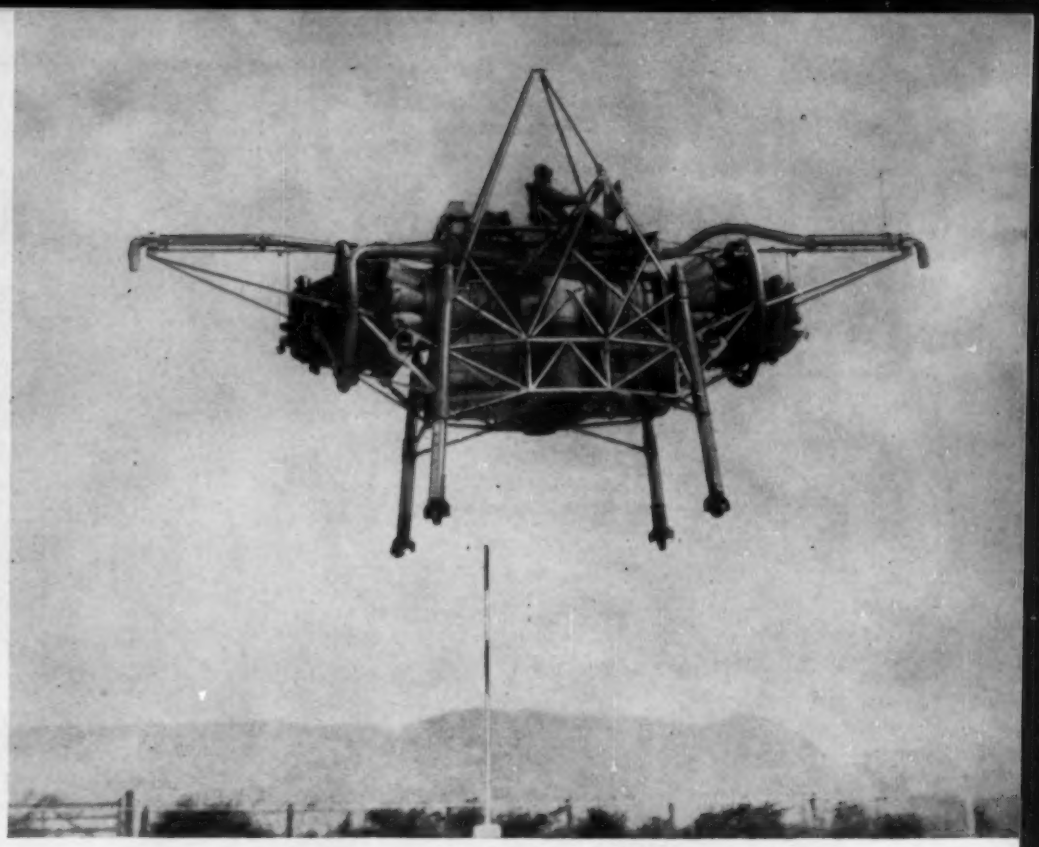
Victor Inquest

A VERDICT of accidental death was returned at the Bedford inquest, on September 24th, on the four aircrew—test-pilot R. V. Ecclestone and his flight observers—who lost their lives when the first prototype Victor crashed at Cranfield on July 14th.

A witness described how he had seen the horizontal tail surfaces break away from the aircraft. A senior investigating officer of the M.T.C.A. Accident Investigation Branch said that the crash had necessitated certain remedial alterations in the design. They had now been made and the subsequent prototype of this type had been flown. He added: "This complex failure could not have been reasonably anticipated."

COMRADES IN ARMS: Partners in Exercise "Battle Royal"—the first account of which appears on pages 510-511—were Gloster Meteor F.R.9s and P.R.10s, and Republic F-84 Thunderjets (the latter adapted for tactical reconnaissance by the fitting of cameras in wing-tip tanks). Here, one aircraft of each type, with the Meteor F.R.9 farthest from the camera, is seen in the neighbourhood of Gutersloh, where a flight of Thunderjets was operating as an element of No. 2 Squadron, equipped with Meteor F.R.9s and commanded by S/L. R. H. D. Weighill, D.F.C.





QUADRUPED: This photograph from a ciné-film is the only view of the Rolls-Royce V.T.O. machine cleared for publication. In the background is a graduated pole, a position index.

The Rolls-Royce V.T.O.

ONLY one photograph of the Rolls-Royce V.T.O. test vehicle has so far been released for publication, and it is reproduced on this page. No details may be given of the machine other than those already published or discernible from the photograph.

It can be seen that the two Nene turbojets are arranged to discharge into large boxes where—no doubt with the aid of a cascade of vanes—the efflux is turned through 90 deg to emerge vertically from beneath the centre of gravity of the vehicle. Between the two nozzles can be seen what appears to be a third nozzle of rather greater diameter.

The machine is controlled by four compressed-air jets which can be seen projecting downwards on the ends of bracing struts mounted on each of the four sides of the basic frame. Air for these jets is bled from the compressors of the Nenes (the collection pipes are prominent) and passed through a valve assembly in which, according to the positions of the pilot's conventional stick and rudder pedal assembly, the air is fed to one or more jets to maintain a level flight attitude. The photograph shows that the pilot faces along the longitudinal axes of the engines; presumably the engines would be identified by the designations "front" and "rear." Pulling the stick back would then bleed air to the jet seen on the right of the photograph, so causing the machine's "nose" to rise.

Other points worth noting are the four shock-absorbing legs (fitted, in best bedstead tradition, with small castoring wheels) and the pair of fuel tanks slung under the engines.

It is reported that a second, and probably improved, machine is under construction. Incidentally, the present vehicle is the first flying machine of any sort to have been made by Rolls-Royce.

TEST TRIO: In charge of the Britannia hot-weather trials (see opposite page) is Mr. "Bill" Pegg, the Bristol Company's chief test pilot. Pictured with him before take-off for Tripoli are (centre) the chief test pilot of the A.R.B., Mr. D. P. Davies, and the flight superintendent of B.O.A.C.'s Britannia Fleet, Capt. A. S. M. Rendall.

EXAMINING AVRO DEVELOPMENTS in lightweight sandwich structures are, left to right: Mr. S. D. Davies, the company's chief designer, Brig. Gen. Harley Jones, U.S.A.F., Brig. Gen. John J. O'Hara, U.S.A.F. and Roly Falk, Avro superintendent of flying. (See "Production Probe.")

New F.A.I. President

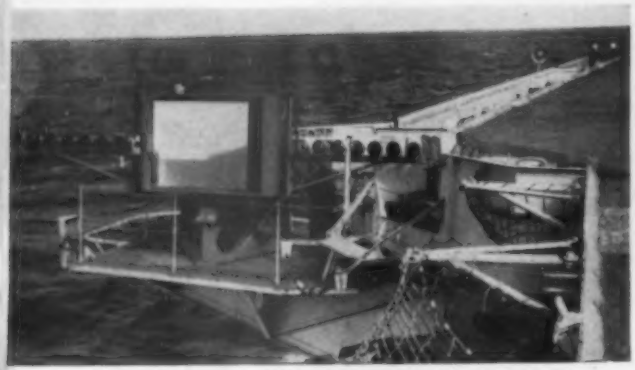
THE election of Capt. K. J. G. Bartlett, C.B.E., a director of the Bristol Aeroplane Company, as president of the Fédération Aéronautique Internationale, has been announced. Previously Bristol sales director, Capt. Bartlett retired from this post last year to act as the firm's senior representative in Europe, with his office in Paris. Well known in the aviation world, he joined Bristols in 1928.

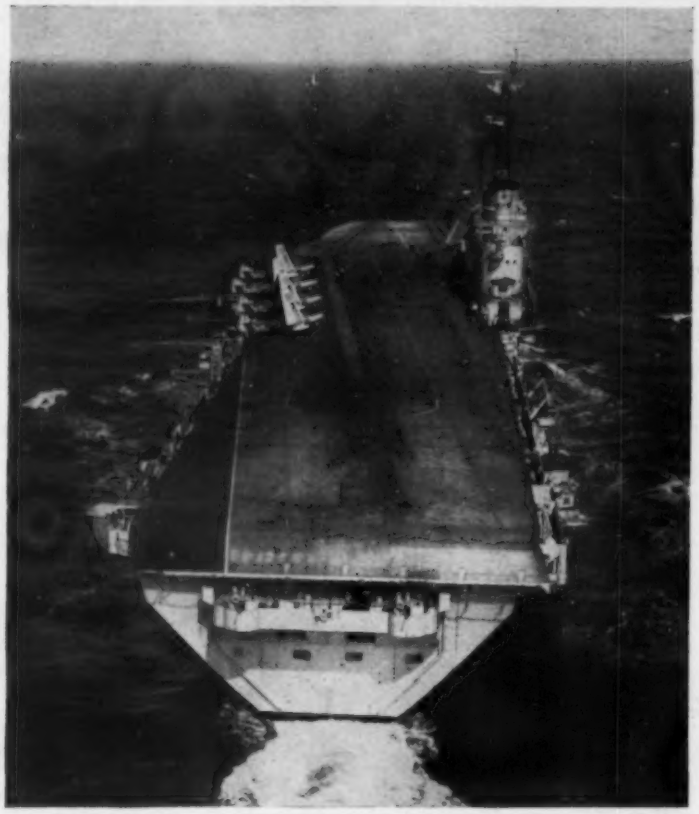
Production Probe

BETWEEN September 22nd and 24th, the most powerful American procurement and production mission that has yet visited the United Kingdom made a flying tour of several British aircraft plants. The mission was led by the Hon. Roger Lewis, the U.S. Assistant Secretary of the Air Force (Materiel), and included a number of development, procurement and production agency officers, together with several U.S.A.F. generals. Transport was provided by a U.S.A.F. Dakota. A number of Hawker Siddeley Group establishments were examined, including Hawkers (Kingston and Dunsfold), Brockworth Engineering, Glosters (Moreton Valence) and Avros at Chadderton.

"ALBION" AT WORK

Mirror-aid on a Semi-angled Deck : Carrier Debut of D.H.110





H.M.S. "Albion" is the first British carrier to be fitted with both the angled deck and the optical deck-landing aid. In the above picture four of 898 Squadron's Sea Hawks are parked on the port side of the landing area; the mirror sight (level with the nearest machine) is shown in close-up on the left.

HAD the first H.M.S. *Albion* been fitted with an angled deck and a mirror landing device, and had a supersonic bang announced a certain visitor's arrival, His Majesty King George the Third would doubtless have been a very surprised man when he reviewed his Fleet in 1773. This random thought occurred to us last Thursday on the occasion of a visit to the 74-gun 1,662-ton ship's fifth successor, a modern aircraft carrier of the Hermes class.

"Rendezvous 8.15 a.m. sharp at Boat Steps at Sea End of Weymouth Pier," the official Admiralty pass had urged. This accomplished, punctually if not sharply, we were conveyed to the carrier and (the Navy retaining a balanced sense of priorities) confronted with a wardroom full of man-sized breakfasts. After the meal, our programme was to include a glimpse of flying exercises in the Channel by the ship's Air Group (Sea Hawks and Skyraiders), while to top the bill was the first appearance on any carrier of the D.H.110.

H.M.S. *Albion*, sister-ship of *Centaur*, is the second British carrier to carry an "interim angled deck" of 5½ degrees to port. Commissioned in May of this year, she is now working up with her Sea Hawks and Skyraiders; the Wyverns of 813 Squadron were due to land aboard on the day after our visit. Perhaps the most significant feature of *Albion* is that she is the first carrier to be fitted, for normal use, with the mirror landing-sight device. In command of the ship—which has a peacetime complement of 1,300 officers and men—is Capt. G. H. Beale, D.S.O., O.B.E., R.N., previously Commanding Officer of R.A.N.A.S. Nowra, N.S.W.

The principle of the angled deck for aircraft-carriers was tried and proved in the U.S.S. *Antietam* last year (a visit to the ship was reported in *Flight* of July 10th, 1953). As the construction of both *Centaur* and *Albion* had reached an advanced stage by the time the advantages of the new-type deck were known, a compromise between the conflicting demands of economy, modification involved, labour, and flying requirements was made: it was decided to use an angled deck of 5½ degrees, compared with the 10 degrees of the American *Antietam*.

The basic advantages of the angled-deck technique—the clear space ahead for overshoots and the increased parking space—are retained in this interim design, although only one of the two catapults can be used while landing is taking place. The full angle would, of course, give increased parking space, as well as permitting the operation of both catapults.

The value of the mirror landing sight, or "optical deck-landing aid" [described in *Flight* of March 19th, 1954] had been shown in a series of trials, involving several hundred landings, on the carriers *Illustrious* and *Indomitable*. The first developed version of the original mirror apparatus is that now fitted on the port side of *Albion's* flight deck: a second mirror system is also to be installed on the starboard side in the immediate future.

It may be recalled that, in this method, the main mirror reflects a horizontal bar of light, projected by a row of white lights (seen in *Albion* to be mounted on a boom some distance from the mirror

First carrier touchdown by the hookless D.H.110 was made by Lt. Cdr. "Jock" Elliott on the deck of "Albion." Among the de Havilland representatives on board was chief test pilot John Cunningham.

"Albion" glimpses: light and shadow, and Sea Hawks moving towards the catapult points; a cartridge start prior to touch-and-go circuits; a Skyraider of 849 Squadron lands on; and the 110, after touching, begins to "go" in its own thunderous way.

"Flight" photographs

itself). This reflection, observed by the pilot on approach, is lined up with a row of coloured lights extending on both sides of the mirror. Or, as Lt. Cdr. C. B. Lewis, R.N., mirror-aid project officer, phrased it, the coloured datum lights act as a "backsight" in which the source-light image or "foresight" is aligned. As the mirror is concave, indication is provided over quite a wide horizontal angle, in case of approaches which are not lined up with the centre-line of the landing run. The mirror itself is gyro-stabilized in pitch but not in roll. It appears most probable that the new device will in future be fitted as standard equipment in carriers—and also at Naval air stations.

The aircraft which were to demonstrate the use of the mirror aid for our benefit were the Sea Hawks of 898 Squadron, which had embarked in *Albion* only four days previously. Also flying were the Skyraiders of 849 Squadron's "C" Flight, which had been on board just two days longer.

The carrier turned into wind, and we ascended to a vantage-point on the island. Two Sea Hawks were placed in position, one on each of the hydro-pneumatic catapults, and launched in turn with a seemingly sickening acceleration over the bows of the ship. Two of 849's Skyraiders then took off under their own power, and performed some conventional circuits and landings, using the services of a batsman in place of the mirror aid.

Touch-and-go circuits by the Sea Hawks followed, at first using the deck landing officer's signals for the approaches, and later the optical "beam." Although the pilots had been flying from *Albion* for less than a week, their approaches—employing the constant rate-of-descent technique—were consistently steady and accurate. This was indeed an effective indication of the new system's value; but it could not have been "all done by mirrors," and much credit must certainly go to the pilots themselves. The quality of the landing approaches, and of the completed landings executed later, made the whole business of carrier flying seem (to at least one land-based pilot) not so dicey after all.

Throughout the flying, one of the ship's S-51 Dragonfly helicopters kept station attentively to starboard—as if playing the part of the discreet butler in the background—providing a continuous watch in case of aircraft emergencies which might require its mobility and rescue ability. On the flight deck, the alacrity and skill with which the aircraft directors, mechanics and handlers unhooked, moved and parked the aircraft was particularly impressive for such an early stage of working-up.

A crisp double supersonic bang at noon left no doubt that the D.H.110 was on its way into *Albion's* circuit. A fast run at mast-height some minutes later confirmed that Lt. Cdr. "Jock" Elliott in the twin-boom machine had indeed arrived. A wide circuit preceded a low, slow run over the deck, giving observers aboard an excellent close-up view of the big machine in what might be termed its natural environment. Third time round, after a slow, rock-steady approach, the 110 touched down on the deck, to open up and roar off again with surely the most thunderous cacophany so far heard in *Albion*. A number of further touch-and-go circuits were completed before Elliott (recently released from the Service to join de Havillands) tucked up wheels, flaps and air brakes and headed back to Boscombe and lunch.

The afternoon's flying began with a repeat performance by the D.H.110, which carried out more touch-and-go's, on much tighter circuits this time. The exceptional steadiness and low-speed control of this machine made it appear very attractive for carrier work to the Naval observers present. It was confirmed on board *Albion* that an Admiralty order for the 110 would be placed subject to the successful completion of evaluation trials. Although the optical landing aid had been set up and switched on prior to both appearances of the 110, expert opinion held that the flying was Elliott-assisted throughout, and not in fact mirror-assisted on the approach.

Formation and individual aerobatics by a four-Hawk 898 team followed. Solo performances by Lt. A. R. Wright alternated with those of the Squadron C.O. (Lt. Cdr. Ian Campbell), Sub-Lt. Peter Swain and Sub-Lt. Tony Shortell in formation. Apart from mentioning the elegant ease with which they changed formation on the top of loops, we may sum up by saying merely that 898 was on its best aerobatic behaviour that day, its doings well deserving at least another full page in the Squadron's own most illuminating scrap-book.

With less than a week's "working-up" aboard *Albion*, the ship's Air Group, under the direction of Cdr. P. C. Whitfield, Commander (Air), had put on an impressive day's show. The optical landing aid was seen to be a great improvement in the landing control of jet aircraft on carriers, and a further example had been given of the advantages of the angled deck—even if the angle had been bisected.

K.T.O.

BATTLE ROYAL

A Combined Exercise with an Atomic Accent Part 1

Air Marshal Sir Harry Broadhurst, K.B.E., C.B., D.S.O., D.F.C., A.F.C., Commander-in-Chief 2nd Allied Tactical Air Force.

EXERCISE BATTLE ROYAL, which raged between September 22nd and 28th, was the biggest manœuvre held in Northern Germany since the war. Jointly directed by H.Q., Northern Army Group (Commander, General Sir Richard Gale) and the Second Allied Tactical Air Force (Commander, Air Marshal Sir Harry Broadhurst), it involved some 137,000 troops, units of the R.A.F., the Belgian and Netherlands Air Forces, the U.S.A.F. and the Sixteenth British Airborne Division (Territorial Army).

At his pre-exercise briefing General Gale declared that our military training must be directed towards the tactical employment of atomic missiles on the battlefield. He did not believe that there could now be any exercise in which such missiles did not play an essential part. First he wished to find out how a comparatively small force, without a superiority of atomic missiles, could deal with a numerically superior force having "some" of these weapons. Then he wanted to see how the large number of vehicles required at present for logistic support could be reduced, and to try various expedients for increasing mobility in the fighting units. (To some extent, he thought, this could be achieved by far smaller tactical groupings, and, in the case of the 2nd British Infantry Division, he was experimenting accordingly.)

The General's next aim was to practise the Commander and staff of a fully integrated British/Netherlands Army Headquarters in working with a Tactical Group of the Air Force. Corps under its command would consist of divisions of different nationalities. Another aim was to see how armoured divisions could disperse under the threat of atomic attack, and then re-group for quick movement.

Turning to the limitations of the exercise, General Gale said that no weapon "of the future" (by which he meant the hydrogen bomb, guided weapons or chemical warfare) had been considered; nor had he taken account of the "civilian aspect"—the problem of refugees and incidental civilian casualties from atomic attack.

Aggressor nation in the battle was Northland, whose territories lay to the north of a line Osnabruck to Bad Oeynhausen. The victim, Southland, was flanked by Ruhrland and Skiland, whose land was inviolate, but whose air was free to all (by reason of the fact that all exercise resources had been deployed and no flank controls could be provided).

We discovered that the forces involved were involved indeed. Responsibility for the invasion was vested jointly in Western Army Group and 2nd A.T.A.F.—commanded respectively by "General George Boreas" and Air Marshal Broadhurst. As Gen. Boreas, Gen. Gale was superior commander of Northland; under his own name he was director of the exercise; and as "Gen. Mistral" he was superior commander of Southland. Southland was to resist with the aid of 83 Tactical Group, R.A.F. (consisting of R.A.F. and Belgian Air Force units) and a battalion group of the 16th Airborne Division, based in the United Kingdom. This group would total about 600 men, and would drop to represent three battalions. Both South and North had a battalion of American 280 mm mobile heavy artillery, lent for the exercise by General Hoge, Commander of the Central Army Group. Atomic shells had been allotted with these guns and both sides had been authorized to use air-delivered atomic bombs. Though Southland had considerable atomic superiority, Northland was numerically stronger.

Air participation was outlined for us by Sir Harry Broadhurst himself and by G/C. Jones, his Group Captain Operations. As was usual in combined manœuvres, Sir Harry said, it had not been possible to exercise the Air Forces realistically. There were many good reasons for this, not the least being that the ground which suited the army could not be reconciled with the air-defence system. Moreover, bearing in mind the speed and range of modern aircraft, the manœuvre area was very restricted. Though little would be seen of the Air Force in its primary rôle of fighting the air battle, all functions requiring intimate working of the joint Army/Air Staffs would be exercised. Of first importance, the Air Forces would be able to practise close and general support, thus keeping alive procedures and ensuring that, in war, support could be given quickly at the right time and with the most suitable weapons.

From this consideration Sir Harry turned to "external" bomber forces, on which topic his remarks were especially pointed. Though in the last war, he recalled, external bomber forces were used on several occasions to influence tactical ground situations—sometimes with decisive effect—the process was a cumbersome one, for it was necessary to concentrate up to 1,000 aircraft, and as much as 24, or even 48, hours' notice was required before these could be on target. Today, the same destructive—and probably greater moral—effect could be achieved by one fighter/bomber dropping an atomic bomb, whilst a raid by "just a few" light bombers carrying "A" or "H" bombs could create widespread devastation in the battle area. Though it should be possible, Sir Harry said, to lay on such strikes with great speed and accuracy, there were factors at present which tended to slow down the machinery; for example, retention of atomic-weapon control at very high level.

The new army tactics of quick concentration, attack and dispersal, he pointed out, placed a premium on the time required to call on external support by A-bombers; so he was striving for the

quickest means of laying on atomic attacks as targets presented themselves. Reconnaissance he described as being of "supreme" importance, and he was employing all his resources at maximum intensity. He referred to new ground equipment with which it was hoped to improve the speed and quality of photographic processing and interpretation, and he told us something of the "night air battle" phase planned for the nights of September 23rd, 24th and 27th. This was to consist of a series of raids by external bomber forces against the 2nd A.T.A.F. area and would test and exercise the defences against the sort of attack which could be expected over a battle zone. On the designated nights No. 2 Group (Air Marshal Hallins-Pott) and No. 83 Group (Air Marshal Lees)—respectively Southland and Northland Air Forces—would combine against the raiders.

Finally Sir Harry had something to say about the Allied nature of his Command. In No. 83 Group, he told us, British and Belgian units were working together in "complete harmony," and at all levels of control a mixture of both nationalities was to be found. The same applied, though to a lesser extent, in 2 Group, where British and Netherlands units were working side by side. Integration of the Group's H.Q. should be completed in a month or so.

G/C. Jones gave us a still more detailed picture of the air side of the exercise, which he introduced with the reminder that Headquarters 2nd A.T.A.F. was acting as superior H.Q. and Control for both Southland and Northland Air Forces. Due to a large influx of pilots during the past year, he said, it was essential to reduce the disruption of training to a minimum; to that end Wings were not being re-deployed under field conditions, except where essential for exercise purposes.

On Southland's side were intercepter day fighters (Sabres) at Brüggen, Wildenrath and Geilenkirchen; a fighter/ground attack wing (Venoms) was based at Norvenich; and there were Belgian F-84s at Bierset and Weelde. At Gutersloh was Southland's Tac. R. force, consisting of R.A.F. Meteor F.R.9s and Belgian F-84s, and at Wahn, Meteor N.F.11s for the night phase.

Northland had Sabre day intercepters based "in the north"; fighter/ground attack wings of Venoms at Wunstorf and Fassberg; a Tac.R. force (Netherlands F-84s and R.A.F. Meteor F.R.9s) at Bückeburg; and Meteor N.F.11s at Ahlhorn.

A photographic reconnaissance force, the available effort of which was to be apportioned as required between Northland and Southland, was based at Gutersloh. Its constituent elements were an R.A.F. squadron of Meteor P.R.10s and a detachment of four RB-26s of the U.S.A.F., these last for night reconnaissance. Additionally, four P.R. Canberras were standing by in England. As for the airborne assault, No. 16 Airborne Division, T.A., was being flown out to Bückeburg on September 24th and would drop over the battle area (in support of Southland) during the 25th-26th.

One problem confronting the organization staffs of 2nd A.T.A.F. was the provision of airfields, and the Airfield Construction Branch would be laying a P.S.P. strip at Achmer from the 22nd onwards. Additionally, the disused (bombed) airfield at Voden would be repaired, and a P.S.P. extension added. "Paper" exercises would be concerned with the repair of supposed damage. At Ahlhorn there would be an enquiry into ways of repairing an airfield with the minimum of interruption to flying, and at Gutersloh it would be imagined that the captured airfield had been blown up by its former occupants. A Mobile Field Hospital would move from Rostrop to Brüggen, staying one night in the woods at Heek.

Among the duties falling to the Exercise Control Cell would be that of placing "unexploded bombs" at Fassberg and Celle. A bomb disposal flight would be alerted to deal with the Celle incident, and when on the spot would be told of the second nuisance, which would mean splitting the flight there and then. The airfield at Norvenich, and a site at Meppen range (a fictitious airfield) had been selected for stocking by the armament staff, on the assumption that a ground-attack wing would be operating from each at an intensive rate. Finally, Brüggen and Ahlhorn airfields would be destroyed—to the extent, at least, of actually detonating the demolition fuses.

On the first morning of the battle we declined with some reluctance an invitation to view one of the famous 280 mm guns of the U.S. Army; but in the knowledge that this mighty weapon will be of interest to airmen and groundlings alike we pass on such particulars as we could elicit. Most significant is the gun's ability to deliver atomic—or conventional—shells in adverse weather by day or night. It was first tested with the atomic shell at the Nevada proving ground last May and its maximum range is about 20 miles. At longer ranges it is said to be "four times more accurate" than any mobile artillery piece developed prior to World War II. The gun itself is carried between two transporter-cabs, each with a 375 h.p. Ordnance-Continental air-cooled engine, at speeds up to 35 m.p.h., though the weight of the complete unit is something like 85 tons. It can travel cross-country and will fit into a landing ship for amphibious operations. The front and rear drivers have an intercom system and the unit as a whole can be moved forward, backward or sideways, for either transporter can pull while the other pushes. Though extensive use is made of high-tensile, high-carbon steels and aluminium, the top carriage alone weighs 16,000 lb. Overall length is 84ft 2in. The claim that the gun affords close support of an accuracy and potency never before available can certainly be credited, and we could well understand the assiduity with which (as we found on arrival at Gutersloh) the Tac.R. Meteor pilots had been searching for the lair of one of the monsters.

Reconnaissance

The weather was wretched, even by U.K. standards, though the occasional Meteor was to be heard or seen returning from a high-level (P.R.) or low-level (Tac.R.) mission. The respective Meteor marks for the jobs are, of course, the P.R.10 and F.R.9, and we saw a squadron of each, in addition to Belgian F-84s and four dark, handsome strangers, in the shapes of RB-26 Invaders of the 1st Tactical Reconnaissance Squadron, U.S.A.F. These were commanded by Capt. Goff, who told us that their home base was Spangdahlen; and, as we have said, their task in Battle Royal was night photography. Capt. Goff looked forward to the re-equipment of his squadron with RB-57s (Martin-built Canberras), and though he had never seen one of these machines, he had been much impressed by some P.R. counterparts by English Electric which had turned up at Gutersloh.

At Tac.R. Ops. we gathered that seven sorties had been flown that morning on a suspected H.Q. and several radar sites. Road and area searches had been laid on and a section was at that moment airborne to locate a 280 mm gun, alleged by Intelligence to be lurking N.W. of Osnabruck. We saw how pilots were doubly de-briefed (by the Army G.L.O. and an R.A.F. Intelligence officer) and how the "recce. snaps" were passed back to Southland's Belgian Corps. (This Corps consisted of the 1st Belgian Infantry Division and the 16th Belgian Armoured Division, and had command of the 1st Canadian Independent Brigade and the 46th British Parachute Brigade Group.)

S/L. Weighill, officer commanding No. 2 Squadron (Meteor F.R.9s), told us that, as soon as one of his aircraft landed, the film magazine was whipped out and dried prints made available within 30 minutes. Generally these were used to confirm a pilot's verbal report, though photography was sometimes the primary object of a sortie.

One of the squadron's Meteors had, in fact, photographed the "clutch" of vehicles where we ourselves were talking and the C.O. showed us on the print that the camouflage and cover was well-nigh perfect, though "chaps" were gazing up at the aircraft and giving the show away, as, we were assured, they often do under field conditions.

S/L. Weighill reminded us that the Meteor 9 carries no vertical—only oblique—cameras, and declared himself in favour of single aircraft instead of pairs, which have hitherto been normal in the Tac.R. business. As a one-time pilot of army co-op Mustangs he recalled that, with Me 109 opposition, doubling up was definitely a good thing, with the second man watching the tail of the first;

(*Concluded at foot of page* 534).

"Flight" photographs

Left to right are a Meteor F.R.9 on tactical reconnaissance; a joint army/air de-briefing of a pilot after one such sortie; and pilots of No. 2 Squadron, the unit concerned in the two former pictures. On the right of the group—photographed outside the concealed Tac.R. ops. tent—is the officer commanding, S/L. R. H. D. Weighill, D.F.C.

HERE AND THERE

NEW STABLE: One of the six Piasecki H-21A Workhorse helicopters which, as reported on this page, are being supplied to the R.C.A.F. The engine is a Wright R-1820 giving 1,425 h.p. for take-off, and the rotor diameter is 44ft. The landing gear incorporate squickly inflatable pontoons.

Netherlands Air Strength

THE Dutch Government considers it impossible to expand the Royal Netherlands Air Force before 1957; any increase could only be made at the expense of existing plans for the Army and Navy. This was stated last week by the Minister of the Army and Navy, in reply to a question on defence estimates. He also mentioned "the serious shortage" of volunteer officers and other ranks in the Army and Air Force.

By any Other Name . . .

THE Rolls-Royce "Flying Bedstead"—illustrated on page 507—looks like being permanently saddled with its unprepossessing name unless somebody thinks of a more dignified one. The *Manchester Evening Post* recently held a competition to suggest a name; four readers tied for the prize, all suggesting the same word—"Vertijet."

S. of S. Approves

THE Secretary of State for War, Mr. Antony Head, recently visited the Brough works of Blackburn and General Aircraft in order to make a close study of the Beverley prototype—he had seen it at Farnborough, he said, and now he wanted to see more of it. "It is going to be a tremendous asset to the Army," he remarked. He inspected the production line and also enjoyed a flight in the big transport, which was piloted by Tim Wood.

Tandem Rotors for R.C.A.F.

THE first of six Piasecki H-21A helicopters ordered by the R.C.A.F. for No. 108 Communications Flight was recently handed over at Bagotville, Quebec, where the unit is stationed. It is understood that the ultimate strength of the flight will be twelve helicopters, all of the H-21A type. They are to be used for rescue and communication work in Northern Quebec, an area which is now being opened up rapidly for mineral development.

New Zealand and Helicopters

THE New Zealand Minister in charge of Civil Aviation (the Hon. T. L. MacDonald), has released the report of the special committee set up a year ago to advise on the use of helicopters in New Zealand. The report has been considered by the Cabinet, which has decided that the advantages which might be gained by providing Government funds to buy helicopters are at present outweighed by their cost and limited use. The report recommends, however, that individuals or companies may apply to import helicopters under the same conditions as those which apply to light aircraft. This suggestion has been given Government approval.

FLAGS OF 25 NATIONS decorate the fuselage of the 1938 Beechcraft owned by Mr. and Mrs. Hampden Wentworth of Longren Aircraft, Torrance, Calif., who fly many thousand miles yearly on business. They recently came to England via the northern route. The photograph was taken when they visited Napiers at Luton, to discuss the Napier surface-heater de-icer in which U.S. aircraft constructors have shown interest. With them are (second from left) Mr. C. L. Cowdrey, Napier's manager at Luton and (right) Mr. E. W. Bruce Hill, technical liaison engineer.

Testing CF-100s

GLEN LYNES, a former R.A.F. and Canadair test pilot, has joined A. V. Roe Canada, Ltd., where he is doing experimental and production flight-testing of CF-100s. He learned to fly at the age of 15.

Display Control

COMMENTING on last week's "Behind the Scenes at Farnborough" article, the S.B.A.C. remarks that to the membership of the Display flying control committee should be added the name of G/C. A. F. Bandidt; he is the committee's deputy chairman.

Flat Spin

TWO R.A.F. sergeants spent nine hours a day for a fortnight in a rubber dinghy in Bridlington Bay, Yorkshire: they were testing new fishing gear to be incorporated in survival equipment. Procedure is to catch the first fish on a spinner, then use it for bait. Up to last Friday their total bag was a flatfish and six crabs.

Professorial Commuting-ship

COMEDIAN Jimmy Edwards (a war-time R.A.F. pilot) has purchased an Auster Aiglet Trainer—actually the company's demonstrator. He is using it for week-end journeys between his Sussex home and Blackpool, where he is appearing in a show. The aircraft was delivered recently to Squire's Gate by Ranald Porteous.

Forty-five years after Blériot

A SUCCESSFUL crossing of the English Channel by a radio-controlled model aircraft was made on September 22nd. Taking off from the cliffs of Dover and monitored from an Auster, it flew at 3,000ft and crossed the coast near Calais; then, over the airfield, a strong wing took charge, and it was last seen disappearing inland. Constructed by Mr. S. Allen and Mr. G. Honnest-Redlich, the model was of 6ft span, weighed 7 lb, and was powered by a 3.46 c.c. diesel engine.

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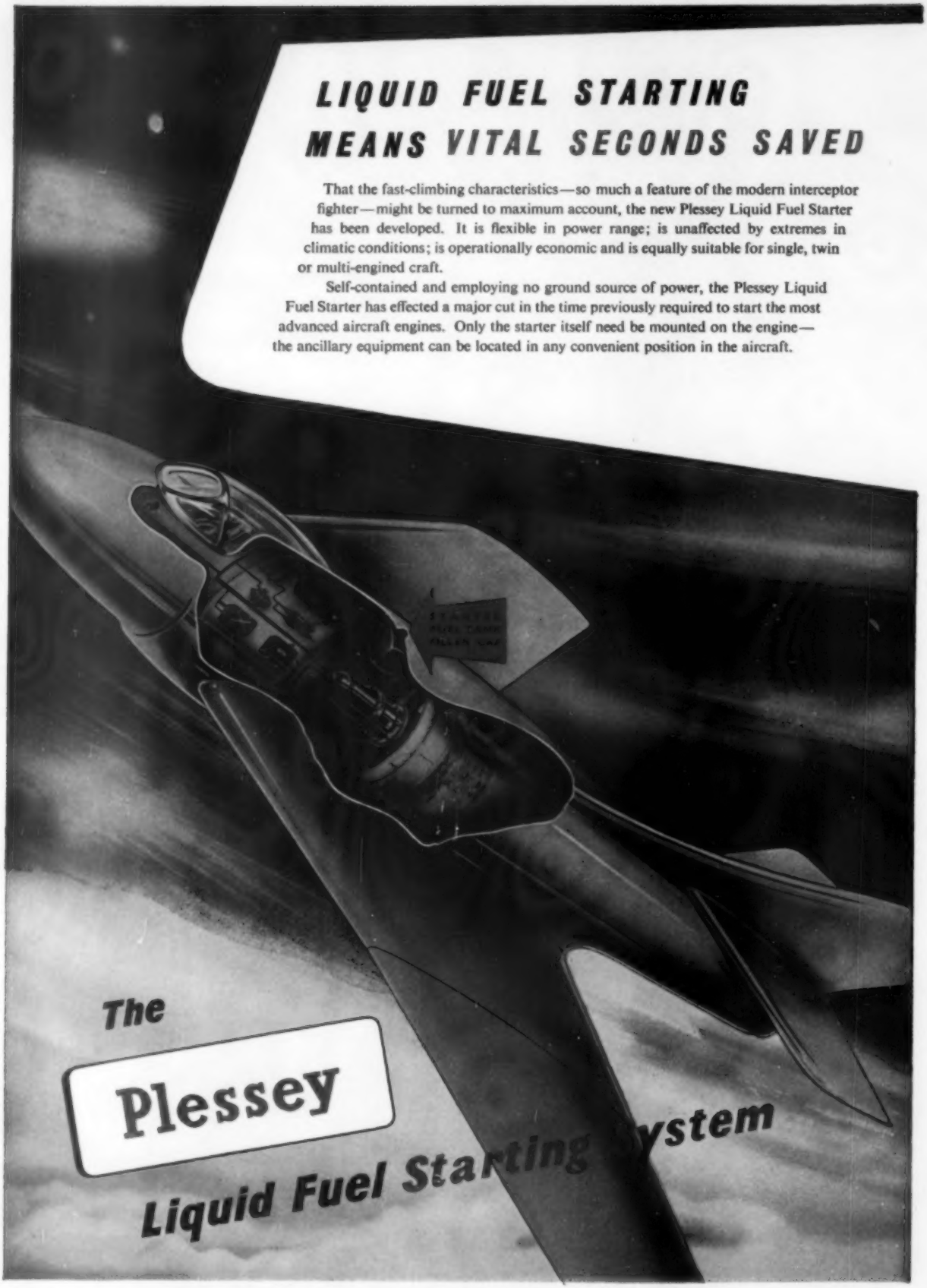

LIQUID FUEL STARTING MEANS VITAL SECONDS SAVED

That the fast-climbing characteristics—so much a feature of the modern interceptor fighter—might be turned to maximum account, the new Plessey Liquid Fuel Starter has been developed. It is flexible in power range; is unaffected by extremes in climatic conditions; is operationally economic and is equally suitable for single, twin or multi-engined craft.

Self-contained and employing no ground source of power, the Plessey Liquid Fuel Starter has effected a major cut in the time previously required to start the most advanced aircraft engines. Only the starter itself need be mounted on the engine—the ancillary equipment can be located in any convenient position in the aircraft.

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A47

A representative group of amateur-built French aircraft: left to right, the RP-40 "Voyageur" and Jodel D.112, both with 65 h.p. Continental A.65 engines, and the Druine Turbulent and Bébé Jodel D.9, both with Volkswagen engines. Note the improved cabin line on this particular Jodel two-seater.

FRENCH ULTRA-LIGHTS

Organization and Results of an Active Amateur Flying Movement

THE recent official British announcement of the relaxation of ultra-light airworthiness regulations happily coincided with the annual rally of the French equivalent of the Popular Flying Association, the Reseau de Sport de l'Air, at Alençon. As the P.F.A. is seriously considering approving certain French ultra-light designs for amateur construction in this country, the meeting held special interest for British enthusiasts. At the rally, which was held from August 13th-15th, the writer was able to study the extent of ultra-light aircraft activity in France and the conditions governing the certification of home-built machines.

The reader may recall the eventful history of the *Pou-du-Ciel*, propagated before the war by Henri Mignet, and the extraordinary enthusiasm that followed the introduction of this design. There are still many exponents of the Mignet formula in France, but it may be safely stated that the more conventional types of light aircraft are now in the ascendancy. The Reseau de Sport de l'Air, of which Henri Mignet is incidentally member No. 1, has a solid background of experience in the construction of ultra-light aircraft and their operation; the results currently obtained in completed aircraft indicate that its members form a highly responsible body of great enthusiasm.

At present there are just over two hundred amateur-built aircraft holding the restricted private Certificate of Airworthiness allowed for such types, apart from a further 100-odd currently clearing their C. of A. formalities and flight-test programmes. Additionally there are some aircraft holding special permits and others with full C.'s of A. constructed outside the present scheme for the private restricted certificate. The number of aircraft at present under construction and not yet declared for certification is unknown and may well run into a further hundred.

The total of purely amateur-built aircraft at present flying is about 240, excluding factory-built examples. Among those with restricted private C.'s of A. are the following types: Bébé Jodel D.92 (59), Jodel D.112 (22), Brochet MB-50 (4), Druine Turbulent (9), Minicab (5), PJ-5A (5), RA-14 (14), SFAN type 2 (5), Starck 70 (8), Starck 71 (4), while the following are at present undergoing the formalities for restricted C.'s of A.: Bébé Jodel D.92 (27), Brochet (8), Turbulent (6), Mignet (10), Jodel D.11 (14), Jodel D.112 (12), Minicab (21), RA-14 (4).

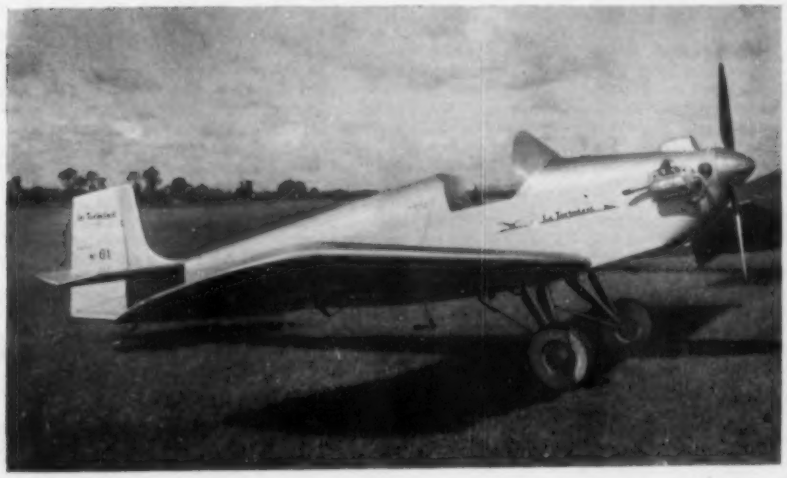
The certification of these aircraft is very simple and straightforward. Application is first made for registration and inspection to the Bureau Veritas, the French equivalent of our own A.R.B., who then examine the aircraft for quality of construction, and authorize a period of test flying, which varies with the type of aircraft.

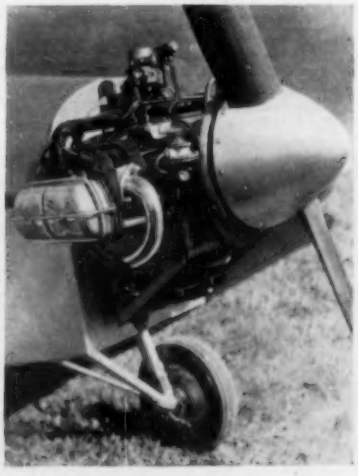
After preparation, the aircraft must carry out a programme of fifteen hours of flight and 50 landings or, in the case of two-seaters, 25 hours and 100 landings. In all cases one of the flights must be to the maximum safe endurance of the aircraft. This programme must be carried out without major repair or maintenance being necessary, only routine maintenance being permitted. At the end of the trial, the distance to take-off from grass (in a wind of less than 5 m.p.h.) and clear a 50ft obstacle must be less than 600 yd, and a similar performance must be realized for landing without brakes. The flights must be within 12 miles of the airfield and must avoid built-up areas. Supplementary tests at fore and aft c.g. limits may also be required.

At the conclusion of the tests the C. of A. is issued for a period of validity of two years. For series-type aircraft following a fully investigated prototype, the requirement is reduced to five hours' flying and 15 landings.

It should be mentioned here that the mutual esteem between the Bureau Veritas and amateur constructors is most marked. This esteem may be said to arise from an appreciation of the

The Druine Turbulent single-seater; this particular example was built by M. Clochez. On the right is the 25 h.p. Volkswagen engine as installed in a Turbulent. The only modification is the fitting of dual ignition.





A vintage ultra-light, this Bassou FB-31.02 was built in 1936; it is fitted with a Salmson 45 h.p. engine. In the lower picture is seen a special version of the Jodel D.9. which, fitted with a cabin hood and special cowling for its Volkswagen engine, won the Coupe R.S.A. at Alenson. Its owner and pilot is M. Deschamps.

FRENCH ULTRA-LIGHTS . . .

fairness and skill of the official inspectors by the constructors, and a similar appreciation of the craftsmanship of the constructors by the official bodies. This situation is altogether most satisfactory, allowing the competent amateur wide scope within the bounds of reasonable protection for third parties. Prospective British constructors could certainly profit from the vast experience available, particularly in respect of the sense of responsibility and prudence necessary to build and operate ultra-light aircraft with safety.

The actual rally held at Alençon was an excellent affair and well organized in that the basic things for such an event—that is, eating, drinking and sleeping arrangements—were properly laid on, although sleeping was rather affected by a lack of sufficient time. There was a refreshing lack of interference from "officials," yet it was most noticeable how members of the public treated the parked aircraft with the respect due.

Of the journey to Alençon by Auster J4 nothing need be said other than that such trips can be very pleasant. All hopes of being the aircraft from the furthest point were shattered by a keen type who had flown, with passenger, in a two-seat Jodel from Algiers in the course of two days. Another splendidly constructed Jodel two-seater, HB-SWA, arrived from Switzerland in company with a Piper Clipper.

On arrival we were welcomed by the *sympathique* Monsieur La Cour, the president, and then taken on a most interesting tour of the assembled aircraft. The owners of these machines were certainly all most proud of their handiwork—and with good cause. The finish and standards of maintenance were without exception superb. While it is perhaps invidious to single out any one aircraft, an example of the little Druine Turbulent was rather impressed on the writer's mind by the owner's insistence that it should be tried forthwith.

The Turbulent Type D.31, F-PGYQ, already flown on a previous occasion by a member of *Flight's* staff (see issue of June 4th, 1954), is the property of M. Clochez, who is a chemist. During construction, which took 2,000 man-hours, every detail was treated with the loving care of the true craftsman and the result is truly a joy to behold. This little aircraft is finished in a jewelescent green gloss finish and certainly looks anything but amateur. The Volkswagen motor has dual ignition, and all possible parts of aircraft and engine are chromium-plated—even the tailskid! To be put in charge of such a delight was responsibility indeed, but the ease and pleasure of flying the Turbulent soon dispelled any qualms. Handling was very pleasant but the lack of a trimmer prevented proper stability checks being made in the rolling and pitching planes. The rate of roll, however, is good, and the directional stability in level cruising flight is positive. Mild sideslips on the glide were satisfactory with a slight tendency to swing into a slipping turn. The mainplane has fixed leading-edge slots, and this helps to make control near and at the stall excellent. The stall is at 40 km/hr (25 m.p.h.) I.A.S., and at 1.3 Vs manœuvrability was good. When flying near the ground one experiences a definite thrill in types like the Turbulent and Jodel, which on reflection shows the need for just as prudent an approach to flying them as to larger types, particularly as the reserve of power is rarely great on this class of aircraft. Landing is simple and the elevator control is nicely crisp at the touchdown. By judicious use of throttle the Turbulent can sit down in a very small space.

By far the most numerous types present were the Bébé Jodels which had arrived from far and wide, and it was one of these, F-PERL, which deservedly won the R.S.A. trophy for this year. This particular Bébé was fitted with a totally enclosed hood and its Volkswagen engine was cowled in the modern flat-four American style, with exhaust pipes on each side in tunnels which formed the cooling air outlets. The induction pipes were heated by being placed in the region of hot air ducted through the cowling. The whole aircraft was finished in a glass-like yellow paint and was trimmed with a chocolate maroon-coloured flash and lettering. At all times it was surrounded by a large crowd of eager types admiring its finish. Among the other single-seater Bébé Jodels, all impeccably turned out, were several masterpieces of tin-bashing in the cowling arrangements.

Two-seater Jodel D.112s were to be seen in profusion and fitted with a variety of engines, including Continental A.65, Minié, and Salmson. The prototype has the Salmson of only 45 b.h.p., and yet seems to have a very good performance, the engine being as smooth and quiet as one might expect from a nine-cylinder radial of that power. Some of the Jodels had modifications to the cabin hoods, particularly in respect of rear-vision cabin windows, this modification in one case having improved the lines of the cabin almost beyond recognition.

Monsieur Delemontez, the co-designer of the Jodel series, was present at the rally and had good reason to be proud of the results of his work.

The Minicab GY-20 was present in small numbers, and it was one of these, F-PERG, of Aeronautique Hauraise, which won first prize in the two-seater class. This little craft is a most efficient touring vehicle and has a tremendous record of rally successes. Fitted with the Continental A.65, it is a good proposition for the sporting pilot, being in a slightly snappier class than the Jodel D.112 and tending with its tapered wing to be more of a factory job than the simple Jodel.

Other two-seaters include the Brochet MB-71 of the Piper Cub formula, and RA-14 produced by Roger Adam as a simple high-wing side-by-side two-seater, and a slick-looking low-wing monoplane with parallel-chord wings and Continental engine, known as the RP-40 Voyageur. This latter aircraft seemed to perform very well indeed.

Two aircraft designed by Denis Piel to a similar formula were the CP-20 "Pinnochio" and its two-seater counterpart, the CP-30 Emeraude. The single-seater is in appearance a model Spitfire 14. The two-seater has side-by-side accommodation in a big cabin, and is a very impressive job with most pleasing lines and cabin appointments.

Probably the most striking appearance was provided by the Bassou FB-31.02 twin-boom low-wing monoplane with a Salmson 45 h.p. engine (mounted as a pusher) and tandem open cockpits. This aircraft had flown from Lyons and, as befitted its age of some 20 years, was aptly named the "Vampire's grandfather."

After a review of the aircraft, the programme was found to be running itself quite happily with demonstration flights going on the whole time, groups involved in animated discussion around each aircraft making the atmosphere truly *amicale*.

The Saturday-evening dinner was a most memorable occasion, with some four hundred people present (there would have been more had not the weather prevented a number of arrivals). On this occasion the results of the competitions were announced amid a great deal of banter and applause. The results had been arrived at following a scrutiny of the aircraft by two judges, one from the Bureau Veritas, Monsieur Bourlanges, and a member of the Secretariat General à l' Aviation Civile et Commerciale. Apart from the two main cups, there were several other prizes, and a special award to the Swiss crew who received a handsome spinner assembly. As a complete change from ultra-lights, the Shell film of the S.B.A.C. display was shown—at 2 a.m.!

At an early hour the meeting restarted at the aerodrome with the sky full of little aircraft buzzing around in the sunshine, each

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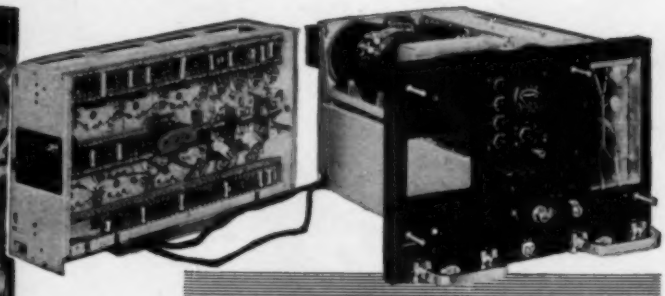

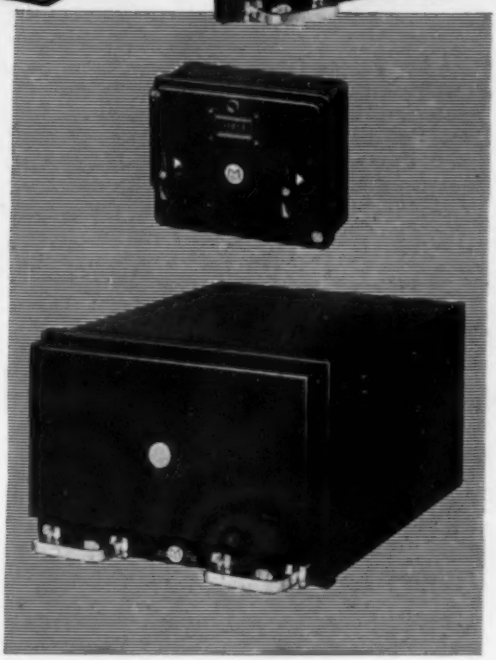

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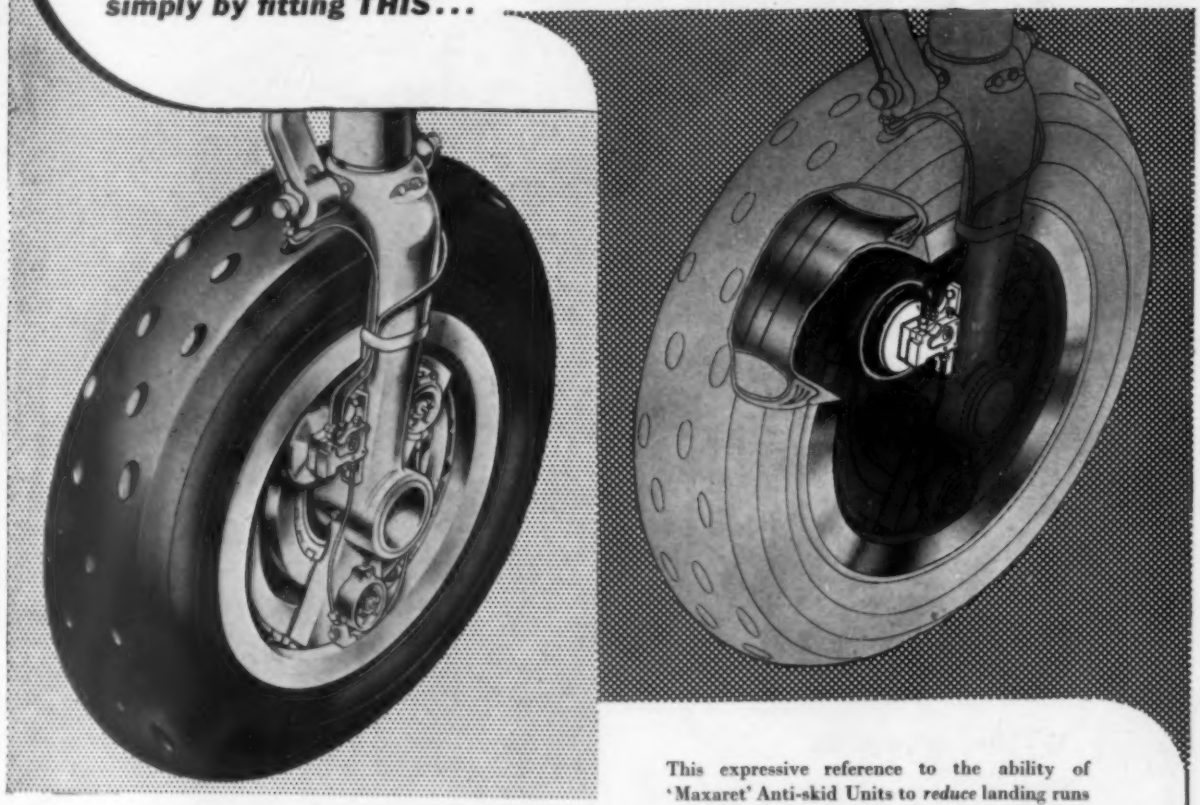

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FRENCH ULTRA-LIGHTS . . .

taking its turn to fly alongside the Boisavia Chablis open high-wing two-seater for the benefit of the photographer in its front cockpit. Above all this the Fauvel AV-36 flying-wing sailplane soared around cocking a silent snook at its powered compatriots until it swept in to land just in time for lunch.

Before lunch a short and moving ceremony was held. Recently Sylvaine Badez (who was to have brought a French ultra-light to Coventry for the National Air Races) was killed in an unfortunate forced landing with a SIPA trainer, due to his trying to avoid a tractor driver; hence the French contingent could not come to the Nationals. All engines at the *Rassemblement* were stopped and eulogies to Sylvaine Badez and Jean Simon, an old club member, were delivered by the president of the Alençon Aero Club. In listing the distinctions of these two pilots there was mentioned service in the R.A.F., a Distinguished Service Order, Croix de Guerre and other awards; after which two hangars were named, one in honour of each, followed by the typical French tradition of a *Vin d'honneur*.

A gathering storm at lunchtime was the signal to put all the aircraft in the hangars: the luncheon tables were moved to make room and then, with a furious rainstorm raging, the lunch continued under the shelter of the wings. Nobody seemed to mind the rain driving in above the hangar doors. With the passing of the rain the J4 was turned reluctantly homewards just as the Supercab arrived for a short visit; with Monday morning at the office looming, the temptation to have a trial flight in this type had to be put off firmly until another time. H. B-D.

THE AERONAUTICAL BOOKSHELF

"Childhood's End," by Arthur C. Clarke. Sidgwick and Jackson, Ltd., 44 Museum St., London, W.C.1. Price 10s 6d.

DESPITE the opinions of some leading literary critics, we regard this latest science-fiction novel of Arthur Clarke's as his best so far. It opens in the 1970s. America and Russia are racing to launch the first moon-rockets when a fleet of space-ships suddenly sweeps into orbit around the Earth, marking the arrival of the "Overlords." They govern Earth for the next 50 years, ending wars, bringing prosperity to all, but forbidding any further interplanetary experiments.

Only at the end of the 50 years do they show themselves, and their appearance is not only a climax of the novel, but perhaps its most brilliantly conceived feature. We can only hope that Mr. Clarke is not a prophet as well as a first-class novelist, for the ending—"Childhood's End"—is fantastic, frightening, and so carefully reasoned that it is almost convincing.

"A Selection of Graphs for use in Calculations of Compressible Airflow," prepared on behalf of the Aeronautical Research Council by the Compressible Flow Tables Panel (L. Rosenhead, chairman). Oxford University Press, Amen House, Warwick Square, London E.C.4; Geoffrey Cumberlege, publisher to the University. Price 84s.

THE companion to this work (*Compressible Airflow: Tables*) has already become widely known and appreciated. In the reviewer's opinion, the new graphical representation will be even more valuable, in that the worker obtains a clear picture of the function immediately; serious errors are rendered almost impossible and accuracy of interpretation is likely to be roughly on a level with that obtained by reference to the tabulated data of the same function—and, in some cases, better.

The graphs are grouped under the sections Isentropic Flow, Normal Shocks, Oblique Shocks, Conical Flow and Reynolds Numbers. Each of these sections contains an introduction, and full elucidation of all the equations used, assumptions made or constants employed is given; and—as far as can be judged without actually using the work over an extended period—there should be no difficulty in obtaining rapid and accurate answers, and, perhaps, in furthering one's own acquaintance with the subject. Clearly, an immense amount of thought has gone into the planning of the volume; and the printing, by Charles Batey, printer to Oxford University, is so excellent that it is a joy to examine.

The only point that might be raised is that, while a work of this nature is excellent as an occasional library reference, it may not be the best way of making such graphs available to the industry or even to research establishments. Admittedly, those who will use the book will probably have clean hands, but it might be of advantage to suggest republishing the curves on separate sheets, of metal or other durable material, so that they can be employed individually, without denying use of the remainder to other workers.

"Fifty Years of Flight," by Welman A. Shrader. Published by the Eaton Manufacturing Company, Cleveland 10, Ohio, U.S.A. Illustrated. Price $5.00.

ORIGINALLY produced for private circulation, this chronicle of the aviation industry in America has now been brought up to date to the end of 1953, and is offered for sale to the general public. It is an excellent buy for anyone who can get around the dollar problem. Its author is director of publications for the Institute of Aeronautical Sciences and editor of the *Aeronautical Engineering Review*, and he has obviously gone to an immense amount of trouble to ensure the accuracy and comprehensiveness of the many thousands of entries, which are illustrated by 600 first-class photographs, including scores of "rare birds."

"The Gyroscope Applied," by K. I. T. Richardson. Hutchinson's Scientific and Technical Publications, Stratford Place, London, W.1. Illustrated. Price 30s.

Based on the 1946 publication entitled *The Gyroscope and its Applications*, this book has been almost entirely rewritten to incorporate new developments which are no longer restricted by security considerations. A general statement of the basic principles and descriptions of some of the wider-known applications of gyroscopic properties is followed by sections dealing with marine navigation and stabilization; aeronautical navigation and automatic control; military weapon control and sighting; and the use of gyroscopes on land. The fundamental laws of the subject are set out mathematically in an appendix. This extremely practical work contains nearly 400 pages and is liberally illustrated with photographs and diagrams.

OTHER BOOKS RECEIVED

To Perish Never, by H. Archer and E. Pine. Cassell and Co., Ltd., 37/38 St. Andrew's Hill, London, E.C.4. Price 9s 6d.

Airplane Design, by G. Corning. Agents: Bailey Bros. and Swinfen, Ltd., 46 St. Giles High Street, London, W.C.2. Price 55s 6d.

Neville Duke's Book of Flying, edited by Edward Lanchberry. Cassell and Co., Ltd. Price 9s 6d.

Sound Barrier, by Neville Duke and Edward Lanchberry (revised and enlarged edition). Cassell and Co., Ltd. Price 8s. 6d.

Tramp Royal, by Sir Michael Bruce of Stenhouse. Elek Books, Ltd., 14 Great James Street, London, W.C.1. Price 16s.

"FLIGHT" PHOTOGRAPHS

MANY of the photographs reproduced in *Flight*, i.e., those taken by our own photographic staff (as indicated on publication) are subsequently available in the form of high-quality prints. Prices are as follows (dimensions given in inches): $5\frac{1}{2} \times 3\frac{1}{2}$, 1s 4d (glossy or semi-matt, unmounted) or 2s (toned sepia, unmounted); 6×4, 2s 6d or 4s; 8×6, 3s 6d or 5s 6d; 10×8, 5s or 7s 10d; 12×10, 6s or 9s 8d; 15×12, 9s 6d or 13s; 20×16 (semi-matt only), 13s or 18s.

Also available are a postcard series, totalling over 200, depicting both historic and modern aircraft of the R.F.C., R.N.A.S., R.A.F. and Fleet Air Arm. Complete lists of the series are obtainable on application. Prices are 8d each card, or 7½d each for quantities of a dozen or more. One view only—in most cases a good three-quarter front or side—is available for each aircraft type.

B.S.I. ANNUAL REPORT

THE British Standards Institution has recently published its annual report for 1953-54. The first full printed report to be issued since the war, this 200-page volume contains notes on the standards projects undertaken and completed during the year for some sixty major industries. Separate sections list the members of the principal councils and industry standards committees within the B.S.I., and subjects in which international alignment of standards is being prepared.

Under the sub-section "Engineering Division" it is noted that an important item in the year's work has been the completion of a large number of standards making provision for the introduction of the Unified thread in bolts, nuts and other parts for aircraft.

The Report is available to non-members at 5s. It is obtainable from the B.S.I. at 2 Park Street, London, W.1.

From Stockholm's airport at Bromma, the delegation flew by Finnish Convair 340 to Helsinki, where they transferred to Il-12s of Aeroflot. Both types are shown here at Bromma, the Il-12 (foreground) being one of a fleet operated by the Czech airline C.S.A.

SINO-SOVIET TOUR

In Mr. Attlee's Wake: Through Russia and China by Il-12

A DESCRIPTION of Russia's airline system, based on an official Soviet year book, was published in "Flight" of July 23rd. This first-hand account of travel on both Russian and Chinese airlines forms an interesting sequel. It was written by Fraser Wighton, the Reuter correspondent assigned to cover the British Labour Party Delegation's recent visit to the Soviet Union and the Chinese People's Republic.

THE civil air fleets of the Soviet Union and Communist China lag markedly behind those of Western countries in modernity and speed, but the standard of flying is good. This is the conclusion I reached after an air journey of 8,000 miles from London across Finland and *via* Moscow through Siberia, Mongolia and China to report the visit of the British Labour mission.

One of the most significant points noted was that nowhere behind the Iron Curtain did I see a single four-engined transport. On the routes travelled, both in Russia and China, all the services seemed to be conducted by three types of twin-engined aircraft. The most modern of these is the Soviet Ilyushin Il-12, with a nosewheel undercarriage, which is not unlike the Swedish Scandia in appearance. Those in which I travelled seated 21 passengers. [Also in service are Yak-16s, Li-2s (Russian-built Dakotas) and a number of Lease-Lend Dakotas.—Ed.]

The relative obsolescence of the Soviet and Chinese types was thrown into relief by the fact that we made the first part of the journey from London to Stockholm in one of B.E.A.'s Viscounts, which are powered by four Rolls-Royce turboprops and cruise luxuriously, silently and almost without vibration at more than 300 m.p.h. At Stockholm we were taken over by Finnish Airways, operating American twin-engined Convair 340s. After this the Il-12, into which we were transferred at Helsinki, seemed a little drab—due mainly to the upholstery and the almost Victorian lack of lustre, emphasized by a matching curtain with a pelmet over the door leading to the flight deck.

The Il-12 seemed a tractable aircraft, reminiscent in some ways of the Viking, with apparently ample take-off power and a cruising speed—on the flights made—probably in the region of 200 m.p.h. The seats are comfortable, and the aircraft, though somewhat noisy, reasonably well kept.

Striking was the omission of safety belts; we did not encounter them on any of the Soviet airliners in which we travelled. There was no question of their having been removed. Examination of the seats suggested that no belts had ever been fitted. In China, on the other hand, all Dakotas in which we travelled were not only fitted with standard American belts but the aircrews were meticulous in seeing that all passengers were fastened before the take-off, and tactfully assisted those seeming to have difficulty. On descending to land the aircrew again walked the gangway to make sure that all passengers had obeyed the illuminated warning—in Chinese—to fasten their straps.

Smoking is permitted in both Soviet and Chinese aircraft.

The aerodromes in Moscow, Sverdlovsk, Novo Sibirsk and Irkutsk in Russia and Peking, Shanghai and elsewhere in China suggested that both countries had adequate supplies of twin-engined transports. In China the Labour mission sometimes had two "specials" at their disposal, as the party included not only the British but officials and interpreters. There was a third aircraft for the Press.

In both countries there was absent the Western custom of the captain wandering down the aisle during the flight and chatting to passengers. In China, however, the aircrew sometimes personally drew glasses of tea from a giant vacuum-flask samovar and offered them around. Throughout the journeys we did not have any cooked meals on board the aircraft. Food usually consisted of a cardboard box of pastries, sandwiches and an apple—below Western standards.

Ground servicing of aircraft seemed prompt and efficient, which was perhaps just as well, because over two hops between Mongolia and Peking one of the engines started to leak oil, which flowed

Part of a ticket issued for domestic travel by Aeroflot to a reader, Mr. C. J. Whyte (Correspondence, "Flight" for September 10th).

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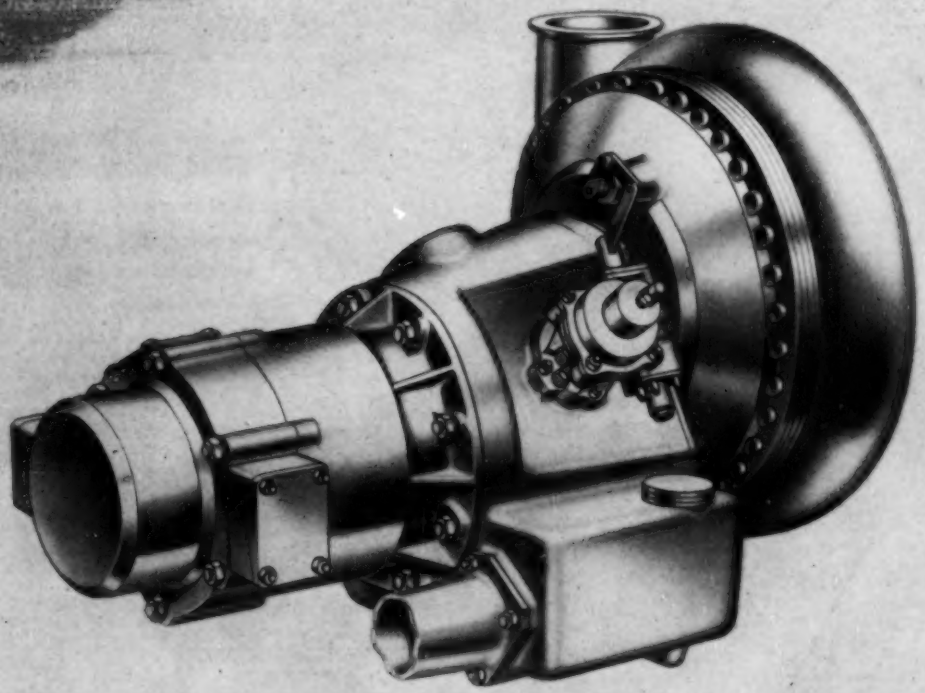

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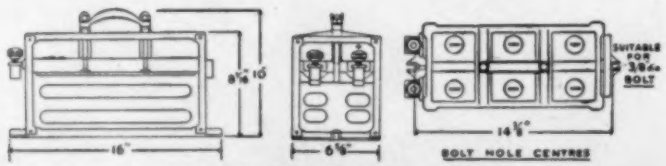

Side and end views of 6-EP19B/2 with battery layout diagram

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SINO-SOVIET TOUR . . .

over the whole of the starboard wing. It was first noticed by a passenger and from then on a member of the crew popped out frequently to study the engine through a window with an inscrutable (though, I must admit, non-alarmist) expression.

At touchdown mechanics got busy and the aircraft took off again on schedule. But about 100 miles from the next landing the leak started again as badly as ever. When we made our next touchdown the mechanics wiped down the wing and made another attack on the trouble and the passengers again took the air, the aircraft this time deciding to behave. The leak was probably not as bad as it looked. But at the time, passing over a country of jagged peaks like sharks' teeth, even though there was plenty of height the prospect of a possible shut-down of one engine was unpleasant.

Throughout the flights in Soviet Russia and China the standard of pilotage seemed good, careful and efficient in the sense that journeys were completed in the scheduled time. There were some ticklish approaches to aerodromes, particularly in China, but there was never a case of pilot losing height sharply or handling the aircraft in any way liable to make the passengers feel uneasy.

The aircraft usually started to descend at an ample distance from the aerodrome, and the actual approaches and tidy landings seemed based on familiarity and long experience with the routes.

The Press travelled throughout in a separate aircraft. I am unable to say, therefore, whether the experience of Mr. Attlee and his colleagues was like that of the Pressmen, but the aircraft seemed similar.

On our flights we saw relatively few military aircraft on the civil aerodromes. A few we noticed were apparently twin-jet medium bombers, probably the Ilyushin "answer" to the British Canberra type.

In China we noticed a number of trainers and here and there odd Mig-15 fighters, but no new long-nosed variety. We did not see any of Russia's "basic" bomber fleet of four-piston engined Tupolevs or any of the reported new bombers.

FOR AGRICULTURE AND FORESTRY

SOME idea of the extent to which aircraft serve agriculture and forestry in the United States of America can be gained from the fact that over 2,000 operators employ nearly 7,000 aircraft to dust, spray and fertilize over 39,000,000 acres of farmland and forest. Altogether some 350,000,000 acres are under cultivation in the U.S.A.

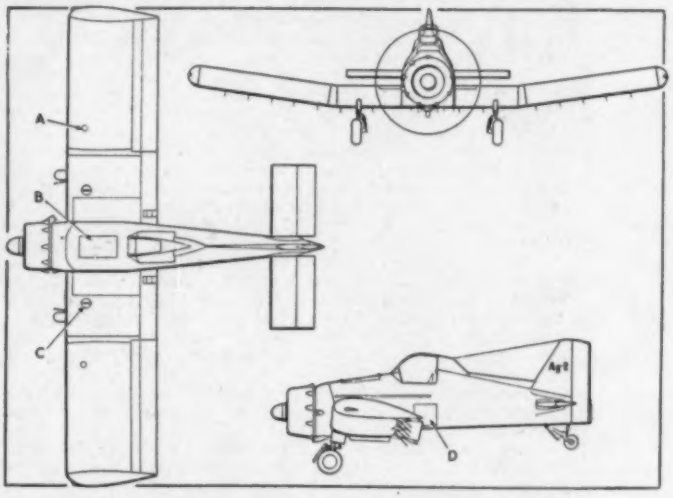
As early as 1922 two aircraft were at work in Louisiana, dusting cotton fields to combat boll weevil; but pest control, aerial seeding and allied work was not taken up on a large scale until after the last war. Many of the aircraft in use are World War II trainers which have been converted for agricultural use. In the U.S.A. one of the leading manufacturers of conversion equipment has been the Transland Company in Los Angeles.

A specially designed agricultural aircraft, designated the Ag-1, was built at the Texas A. and M. College under the supervision of Prof. Fred E. Weick, the venture being sponsored by the C.A.A. the U.S. Department of Agriculture, the College itself and the National Flying Farmers' Association. Over 600 pilots flew this experimental aircraft and their recommendations have been embodied in a successor for which production tooling is now nearing completion. This new type, to be known as the Ag-2, is to be built by the Transland Company, and parts for five prototypes are being constructed.

Like the earlier type, the Ag-2 is to be a robust all-metal single-seat low-wing monoplane, with very thick high-lift wings. Inside the wings are to be plastic tanks to carry 250 U.S. gallons of insecticide or herbicide chemicals. These tanks can be removed, for repair or inspection, through the underside of the wing. The fuselage forward of the high-placed cockpit will contain a hopper providing 53 cu ft of space for seed, dust and chemical fertilizers.

Instead of designing an aeroplane and then installing specialized equipment the designers decided to build the aeroplane round the equipment, which includes pump, rotary-flow metering gate, tanks, hopper, spray booms and spreaders. The hopper and the liquid tanks are controlled from the cockpit by a single lever.

The conditions under which agricultural aircraft work have, not unnaturally, led to a comparatively high accident rate, and the Ag-2 has been designed to provide maximum safety for its pilot in the event of a crash. The structure has been designed for progressive energy-absorption, leaving the cockpit an "island of safety" after the engine, wings and fuselage have absorbed the shock. The pilot's seat and shoulder harness are to be capable of withstanding 40g loading. There is to be a strong crash-pylon behind the pilot to take the loads should the aircraft overturn. Deflectors will protect the cockpit from encounters with telegraph wires, and there are to be wire cutters on the undercarriage. Fuel is to be carried in cell-type tanks in the outer wings.



Points shown in the plan view are: A, fuel tank filler cap; B, dust hopper lid; and C, liquid spray tank filler cap. In the side view D is the stowage compartment. Note the thickness of the wing.

There will be no sharp protruding objects in the cockpit, and no heavy components will be installed aft of the pilot. The cockpit is to be sealed to prevent dust or liquid penetration.

In this type of aircraft the view for the pilot is of extreme importance for taxi-ing, for the application flights and for making turns in the vicinity of obstacles. The seat, therefore, has been carefully positioned to provide maximum visibility.

The Ag-2 will have full-span slotted flaps to provide exceptionally high lift to the lightly loaded wing, and the outer sections of the flaps will serve as ailerons. When the flaps are lowered for spraying or dusting runs the elevators will be automatically trimmed. The flaps are also designed to provide a turbulent downwash in order to obtain the maximum penetration of insecticide to foliage. The dust and liquid tanks will be located on the c. of g. to ensure the minimum of trim change as the load diminishes.

Many Vultee BT-13s have been converted for crop spraying and similar work, and in order to keep down the cost a number of BT-13

(*Concluded at foot of next page*)

In this impression of the Transland Ag-2 the wire deflectors over the cockpit and the wire cutters attached to the undercarriage can be seen.

"COLLISION COURSE" AIR INTERCEPTION

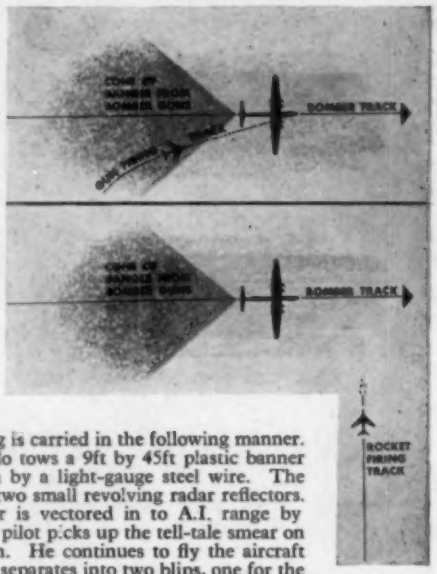
Rocket Attacks from Abeam: New U.S. Technique

SINCE the introduction of radar-aimed tail guns in bombers it has been realized that a night fighter should be able to attack a bomber from abeam instead of by the traditional stern-chasing method. Recent reports of rocket-firing practice with F-94C Starfires and F-86D Sabres in America suggested that the beam-attack technique was under development, and the fact that ballistic rockets could be fired at a bomber-towed banner indicated that a very large angle-off was being used. Last June, the U.S.A.F. Air Defense Command at Yuma, Arizona, held an "aerial gunnery meet" in which one of the phases was an air-to-air rocket interception contest. It was during this event that the U.S.A.F. first revealed that the technique—which has now been called collision-course interception—was in operational use.

As the accompanying diagram shows, the concept is a logical one. To keep clear of the cone of fire from radar-directed guns at the tail of a bomber, the fighter must approach from abeam, and launch its weapons across the bomber's track and ahead of it in such a way that the bomber and the missiles "collide." For a beam approach to be made accurately to a fast-moving bomber, however, and for the rockets to be launched so that a strike occurs, elaborate computing devices are necessary. It is known that the development of these devices has caused considerable difficulties, but they have now been largely overcome.

The weapon used is the 2.75in Mighty Mouse folding-fin ballistic rocket, developed for the U.S. Navy, but adopted also by the U.S.A.F. Each rocket travels at over 2,000 m.p.h. and has the destructive power of a 75 mm cannon shell. On the F-86D a retractable tray of some 20 Mighty Mice is carried under the forward fuselage. In the F-94C Starfire, 24 are carried in covered tubes round the nose radome, with further packs at the wing-tips and sometimes in "pods" at approximately 75 per cent semi-span. The radar gear was developed by Hughes Aircraft Company, and is of the lock-on type, probably also linked with the aircraft autopilot, and incorporating the automatic weapon-launching gear.

According to *Skyline*, the house-journal of North American Aviation, Inc., the technique of interception is for the fighter to be positioned by standard G.C.I. control and manœuvred relative to the bomber to a point where the aircraft A.I. gains contact. This occurs at approximately 25 miles. The interception is then controlled by the pilot alone in the case of single-seat F-86D. He closes in towards the target until he can by one means or other identify it, and at this point he locks his fire control mechanism on to it. Thereafter, all computing is done for him, and the weapons are automatically launched. Immediately after firing, the pilot turns hard away to avoid collision. The rockets are fired in bunches, with the object of obtaining a shotgun-like spread; one hit is sufficient to make a kill.



The traditional (above) and collision-course attacks illustrated in diagrammatic form.

Practice firing is carried in the following manner. A B-45 Tornado tows a 9ft by 45ft plastic banner one mile astern by a light-gauge steel wire. The banner carries two small revolving radar reflectors. The intercepter is vectored in to A.I. range by G.C.I., and the pilot picks up the tell-tale smear on his radar screen. He continues to fly the aircraft until the smear separates into two blips, one for the B-45 and the other for the banner. He then locks-on and makes the attack, taking a film record as the rockets are launched, and holding the aircraft on its collision course in order to secure a photographic record of the complete interception. Meanwhile, a "chase plane," usually another F-86, flies alongside the intercepter, to make sure that it is locked-on to the drogue and not to the towing aircraft.

During the Yuma contest, an umpire in a fourth aircraft flew close formation with the B-45, keeping within its radar response, and dropped back to inspect the banner after the shoot. When, as often occurred, the banner was shot away by the rockets, it was located and retrieved by helicopter and returned to Yuma for assessment. The intercepter's own camera film, however, also showed quite clearly when hits occurred.

An integral part of such an interception system is, obviously, the G.C.I. station, and during the contest the pilots brought their own ground crew and G.C.I. controllers with them to Yuma, even though they had to leave their aircraft behind and borrow others. The G.C.I. controller is considered so important an element in the team that he has been defined as the intercepter pilot's "wing man on the ground."

Although the weapons system of the F-86D and F-94C are as nearly as possible automatic, a great deal of skill is required from both pilot and controller. The advantages of the system lie in the fact that the intercepter is less vulnerable to the bomber's guns, and that the rockets spread in a pattern which covers a fairly wide area. One rocket is claimed to be sufficient to destroy any bomber so far projected. Considerable skill and practice are required, and during the Yuma contest hits were scored on only about 27 per cent of the sorties flown. Even so, one Sabre pilot, early in the meeting, got all 24 of his rockets on the target at the first try.

FOR AGRICULTURE AND FORESTRY

(Concluded from preceding page)

components are being used in the Ag-2. Operators will be able to purchase Ag-2s, complete with dust/spray equipment, in three different ways. A complete "fly-away" Ag-2 will cost $15,000; a buyer turning in a BT-13 will be able to purchase an Ag-2 for $15,000 less the value of usable BT-13 parts plus labour; or a kit of Ag-2 parts will be supplied, minus the BT-13 parts but with assembly instruction.

Principal data on the Transland Ag-2, with 450 h.p. Pratt and Whitney Wasp engine, is as follows:—

Dimensions.—Span, 42ft; length, 27ft 11in; height, 9ft 9in; wheel track, 12ft 4in.

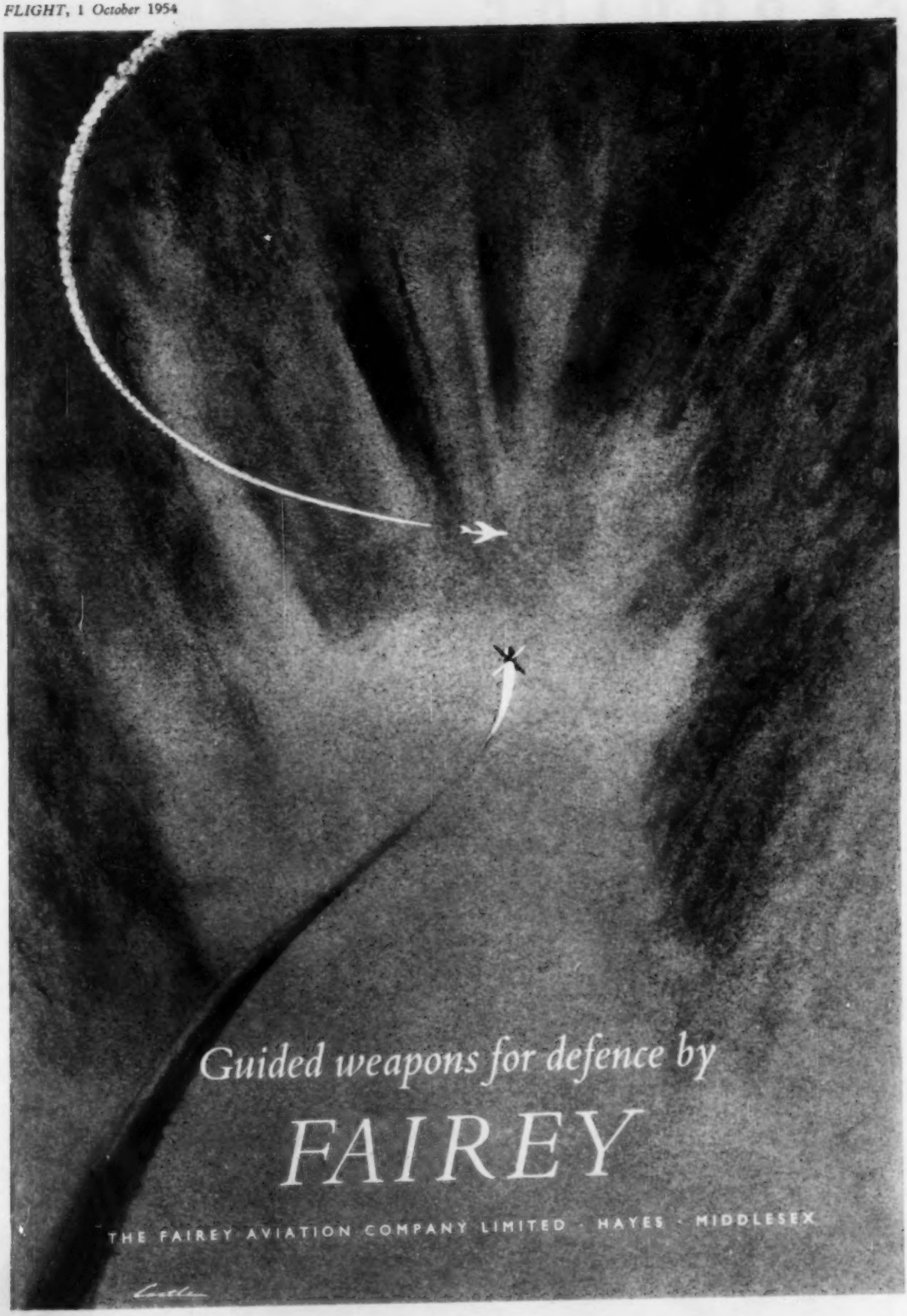
Weights and Performance (estimated performance figures based on Wasp engine with two-position airscrew of 108in diameter).—Empty weight, 2,745 lb; payload, 2,000 lb; all-up weight, 5,200 lb; cruising speed at 58 per cent power with 2,000 lb payload, 110 m.p.h.; landing speed (at sea level, still air and zero payload of 3,200 lb), 48 m.p.h.; take-off distance to 50ft (at sea level, still air) with 1,000 lb payload, 800ft; with 1,500 lb payload, 940ft; with 2,000 lb payload, 1,220ft; landing distance from 50ft (at sea level, still air) with zero payload 1,000ft; rate of climb at sea level with 2,000 lb payload, 900 ft/min.

WANTED—"SIMPLER ELECTRICS"

THE subject selected for this year's vacation school organized by the Electrical Engineering Department of Imperial College, London University, was "Aircraft Electrical Systems." The course began on Monday, September 20th, with an opening address by Sir Frederick Handley Page, C.B.E., Hon.F.R.Ae.S., F.C.G.I. He remarked that applied science was often regarded as excessively vocational, and criticized industry for sometimes seeming impatient of long-term research: he felt all fundamental research to be of more than academic interest in so far as it was ultimately capable of useful application.

After drawing attention to electrical and aeronautical engineering as being the two newest branches of the art, he referred to the problems which have arisen as they have progressively merged, and to the need for closer liaison between members of those branches for more efficient design and progress. He then pleaded for simplicity of equipment, and hoped that eventually one very reliable and safe system might suffice for any aircraft.

His final theme was the need for electrical manufacturers to be one stage ahead of aircraft designers, so that new electrical schemes might be devolped in tried aircraft, and *vice versa*.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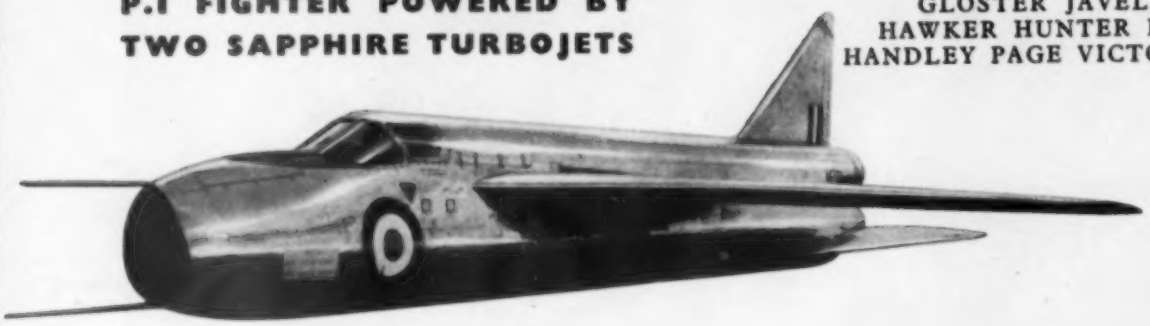

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THE GRUMMAN F9F-9 TIGER POWERED BY A WRIGHT J.65 SAPPHIRE TURBOJET

Also powered by the WRIGHT J.65 SAPPHIRE
REPUBLIC F-84F THUNDERSTREAK
MARTIN B-57 • DOUGLAS A4D-1 SKYHAWK
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The English Electric P.1 and the American Grumman F9F-9, both credited with speeds faster than sound in level flight, are the latest additions to the ever growing list of fighting aircraft powered by the Armstrong Siddeley Sapphire jet engine. The resounding success of the Sapphire and its American version, the Wright J.65 Sapphire, is a significant factor in building up the strength of the air forces of the NATO powers.

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MENTION of turbine-powered transports immediately brings to mind the names Britannia, Comet and Viscount, though the recent appearance of Boeing and Lockheed prototypes signifies the advent of strong future competition in this field. Britain's "big three" are the subject of new illustrations on this and the following pages. The Viscount, of which 154 examples had been ordered and 36 delivered at the time of writing, is represented here by a Series 701 of B.E.A.—G-AMOC *Richard Chancellor*, which has been in the Corporation's service since June last year. Experience with these medium-stage transports, powered by four Rolls-Royce Darts, is at present being amassed at the rate of 1,200 flying hours weekly, of which more than half is being entered in the log-books of B.E.A.'s fleet of 20. Today it is possible to travel by B.E.A. Viscount from London to the following destinations: Athens, Barcelona, Beirut, Birmingham, Copenhagen, Cyprus, Dusseldorf, Frankfurt, Geneva, Gibraltar, Glasgow, Istanbul, Lisbon, Madrid, Manchester,

OF THE NEW GENERATION

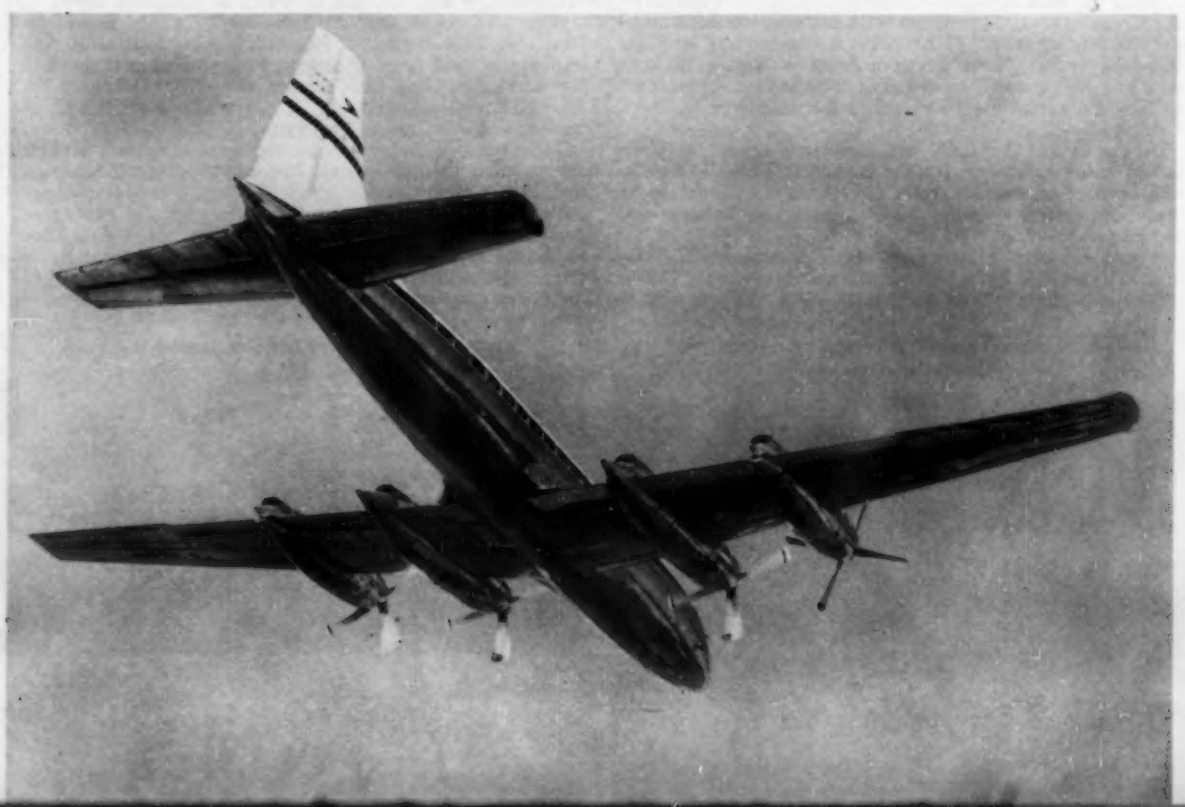
Milan, Munich, Oslo, Palma, Rome, Stockholm, Vienna and Zurich. Other current Viscount operators are Aer Lingus and Air France; T.A.A., the Australian State airline, will shortly take delivery. The setting for the larger study on this page, incidentally, is Shoreham-by-Sea, on the Sussex coast.

OF THE NEW GENERATION . . .

These pictures of a production Comet 2 and the prototype Comet 3 were secured at the time of the S.B.A.C. Show, in which both were demonstrated. The Comet 2 (above) is powered by four Rolls-Royce Avon 503s of 7,000 lb thrust, and is designed to carry 44 passengers on stages of up to 2,200 miles. Avon 521s of 10,000 lb thrust power the 58/76-seat Comet 3, which, as shown by the close-up on the left, has revised air intakes to deal with the greater mass flow. Other distinguishing features of the "3" include the longer fuselage (111ft 6in, compared with 96ft) and "pinion" tanks, which increase the fuel capacity from 6,900 to 8,050 Imperial gallons and add 400 miles to the maximum stage-length with full payload. Both features of the Comet 3 are shown in the view below, which recalls the outstanding liveliness of its take-off and the steepness of its subsequent climb-away at Farnborough.

PHOTOGRAPHS

Three days after its maiden flight on September 5th, the first production Britannia Mk 100, G-ANBA, made its way to Farnborough to take part in the S.B.A.C. Show. *En route*, it was photographed in this characteristic September sky, with a background of strato-cumulus and distant cumulus tops. Normally, however, the cruising altitude would be higher. Below is an earlier study of G-ALBO, first prototype, which has been modified to production standards for C. of A. flight tests (these include the hot-weather trials due to take place this week at Idris, Tripoli). In this unusual view, one of the Proteus 705 turboprops has been shut down and its airscrew, of D.H. hollow-steel, reversing type, feathered.



This El Al Constellation is one of four operated by the Israel airline and a sister-ship to the subject of this story.

UNDER THREE FLAGS

THESE illustrations outline the remarkable story of 4X-AKD, a Lockheed Constellation 049 now operated by El Al Israel Airlines, and probably the only machine of its type to have served with three different airlines. The following details of its career have been pieced together by a contributor in Nairobi, Dennis M. Powell.

The aircraft was delivered to B.O.A.C. in July 1946 after conversion to civil standards by Lockheed Aircraft Services Inc. at Burbank, California (it was originally built as a C-69C for the U.S.A.A.F.—bearing constructor's number 1980 and U.S.A.A.F. serial 42-94559). On delivery, it was registered G-AHEN and named R.M.A. *Baltimore*. On January 8th, 1951, having flown some 11,350 hours on B.O.A.C.'s North Atlantic routes between August 1946 and December 1950, G-AHEN overshot the runway when landing after a training flight at Filton and hit the brick-built superstructure of a fuel-storage tank. Fortunately, there was no fire, and only minor injuries were sustained by the crew. *Baltimore*, however, suffered severe damage to the nose, undercarriage and main spar of the wing.

Since the work of repair was beyond the airline's resources, the Corporation (in agreement with insurance underwriters) decided to "write-off" G-AHEN. A few months later she was sold for $100,000 to a firm of American aircraft brokers, who had the "remains" moved as deck cargo from Avonmouth to New York, and thence by rail to Lockheed's at Burbank, California.

In due course G-AHEN was completely rebuilt, with the aid of many salvaged parts from another L.049 Constellation written-off by Air France. It was then sold to an American charter operator—California Hawaii Airlines—and became N-74192.

Fitted to carry a maximum of 60 passengers, N-74192 logged some 1,153 hours on charter flights between the United States and Hawaii until, in October 1953, she was sold to El Al Israel National Airlines and was re-registered 4X-AKD. Today this remarkable Connie continues to pile up flying hours on El Al's routes between South Africa, Israel, Europe and the U.S.A.—in company with three similar aircraft (4X-AKA, 'B and 'C), one of which is illustrated above.

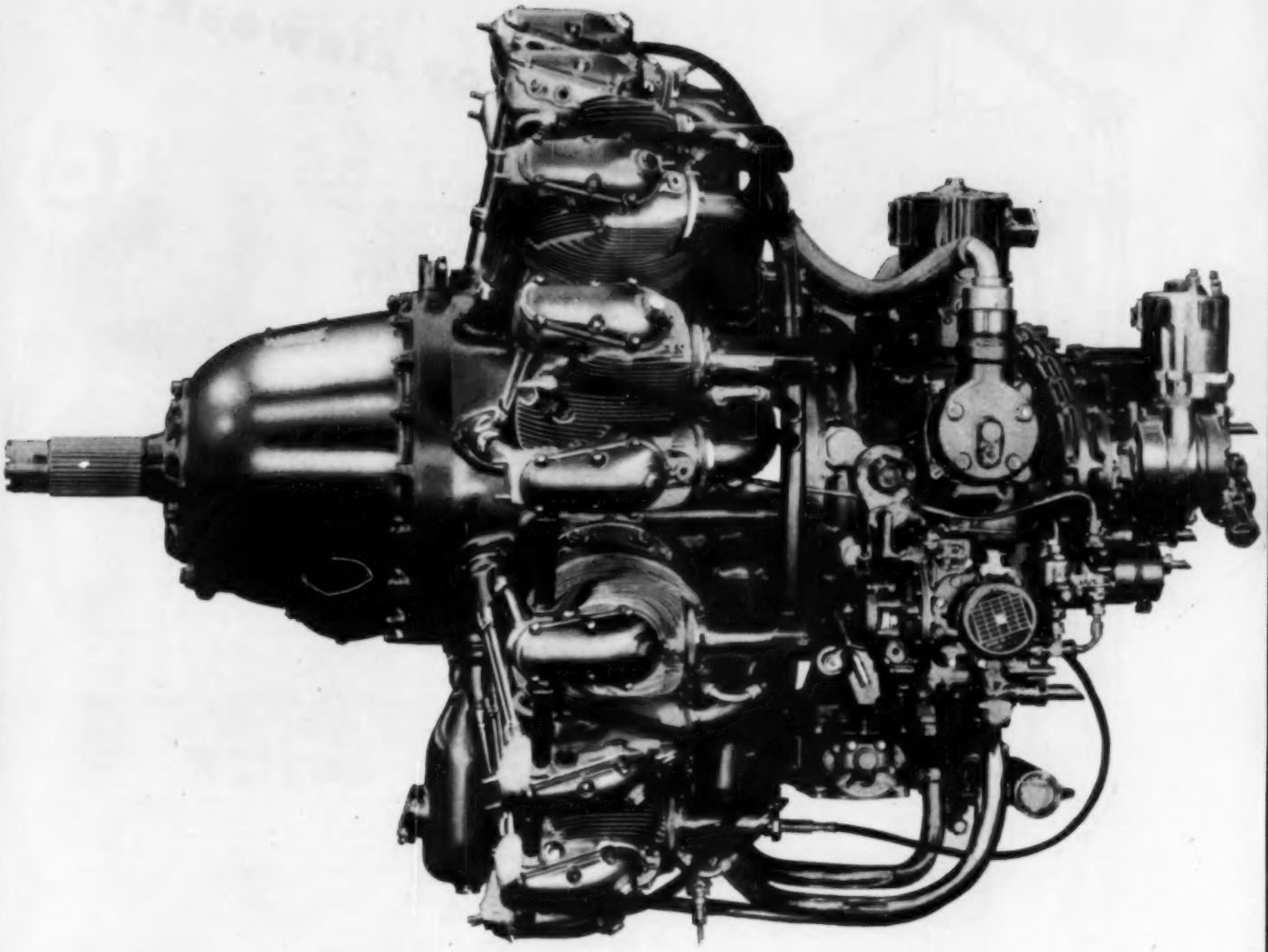
An October 1950 study of G-AHEN, later N-74192 and 4X-AKD.

When 4X-AKD took off from Lod Airport, Israel, on June 25th, 1954, bound for Istanbul, a large crowd of El Al's engineering staff were at the terminal building to witness her take-off. They had completed a 1,200 hr check on 4X-AKD, in addition to a six-week programme of modifications.

This work included the re-arrangement of all cockpit instruments, in order to achieve complete standardization with El Al's other Connies; conversion of the entire passenger cabin to tourist-class seating; and the fitting of a new cargo compartment. Current annual utilization of El Al's Constellations is about 3,100 hr per aircraft or 8½ hr daily—a remarkable achievement, considering that this young airline did not start operating the type until 1951.

G-AHEN after the accident at Filton in January 1951 . . .

. . . and as she appeared after re-entering service in America.



ALVIS

LEONIDES

The Alvis Leonides — 550 b.h.p. 9-cylinder air-cooled radial engine. Weight complete 796 lb. Power / weight ratio 1·45 lb. (0·657 kg.) per b.h.p. Overall diameter 41·5 in. (105 cm.). In quantity production for the Royal Navy, the Royal Air Force and Commercial Operators.

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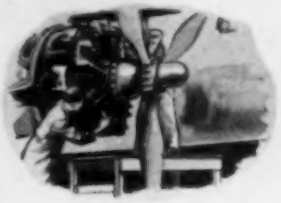
ASPECTS OF AIRWORK . . .

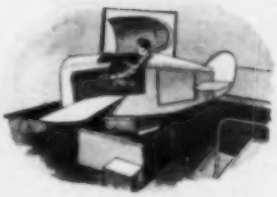
GATWICK Among the many important Airwork activities at Gatwick is the Company's Repair and Maintenance Division, whose work includes prototype installations. The Airwork Radio Department is also based there. Many contracts are undertaken for British and foreign governments and also for private airline operators.

BLACKBUSHE, home base for Airwork's passenger operations, is, in addition, an Airwork aircraft servicing centre. It is also the U.K. terminal for the successful Safari Services jointly operated by Airwork between the U.K. and East, West and Central Africa. This is the first public airline to be run by private enterprise since pre-war days.

LANGLEY Langley is another of the aerodromes at which Airwork undertakes repair, overhaul and conversion of aircraft on behalf of leading aircraft manufacturers and airlines. Experimental and development work is also carried out here.



SCONE This aerodrome near Perth is owned by Airwork. Here the Company organises flying, engineering and navigational training on behalf of the Admiralty and the Air Ministry, including the conversion training of all naval pilots to heavy twin-engined aircraft. Scone is also one of the aerodromes at which Airwork carries out radio overhaul work.



SPEKE The comprehensive repair, maintenance and development work undertaken by Airwork at this Liverpool aerodrome includes the erection, modification and servicing of Sabre jet aircraft operated by R.C.A.F. Fighter Squadron from U.K. bases.

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M.o.S. TECHNICAL CONTRIBUTIONS

—*to Aeronautical Development, as Exemplified at the Farnborough Show*

THE Ministry of Supply, by the very nature of its duties, must perforce hide a goodly portion of its light under a bushel. On occasions, however, it is willing to reveal aspects of its work; so far as the aeronautical side is concerned, a recent example was the demonstration of the duties of the Aeroplane and Armament Experimental Establishment, Boscombe Down (see *Flight*, September 10th), and another was provided by the exhibits on the Ministry's stand at the S.B.A.C. Show.

With the exception of a sectioned guided missile—which we described and illustrated in our issue of September 17th, the Farnborough exhibits were not of a particularly spectacular nature. Nevertheless, they were instructive, especially when studied in conjunction with the information available. Apart from that on the guided missile, we give this information, under subject headings, in digested form below.

Recording of Wind-tunnel Data. In high-speed wind tunnels almost all the force measurements are made by means of wire-resistance strain-gauges used as transducers. The model in the tunnel is supported by a steel cantilever, or by some system of steel members with suitable constraints, and the moments imposed upon these members by the aerodynamic forces acting upon the model are measured by strain-gauge bridges.

A system has been developed for automatically measuring the moment imposed upon each strain-gauge bridge and then transmitting the reading, in a suitable form for recording, to an electrically operated typewriter and also to a punched-card machine. Further developments enable the readings, in rough form, to be plotted against angle of incidence or any other convenient parameter.

The cards are fed into a Hollerith computer, which performs the conversion, taking correction factors into account, and producing aerodynamic coefficients and other data in tabulated form. The coefficients are also produced on a further set of punched cards, which may be used for additional computation or correlation—and also, by a further development, for plotting the final curves automatically.

Hence the entire process of data recording and digestion to usable form is largely automatic and requires only a comparatively small supervisory staff. A saving of about 24 to 1 in manpower is expected, together with a considerable time-saving, which is of importance when the high cost of running a large supersonic wind tunnel is considered.

The method is sufficiently flexible to deal with any information that can be provided in digital or shaft-rotation form. Hence angles, linear positions, servo positions, etc., can all be fed into a common recording system. Even pressures may be recorded, by making use of a specially designed null-balancing automatic manometer. The output of this instrument is in shaft-rotational form and represents the number of turns of a leadscrew required to balance a jockey-weigh-beam.

Data are recorded at the rate of ten digits per second. Hence, in a typical test, one complete set of data is taken every 25 to 30 secs. The attitude of the model is changed while the previous set is stored and is being read out on to the record.

The Farnborough exhibit showed various items of equipment used in this work, notably strain-gauge balances; automatic self-balancing potentiometers; scanner and digitizer units: plotting table; and typewriter and punching units.

Parachute Harness. Among *desiderata* in the design of parachute harness are: (a) provision for immediate extrication on release, even when the wearer is being dragged along the ground in relatively high winds; (b) preservation of an acceptable standard of safety and security in the air; and (c) a standard of comfort and support at least equivalent to existing approved harnesses, e.g., the British Type X.

The Aeroplane and Armament Experimental Establishment has developed harness which, intended for use by airborne troops, is regarded as going a long way towards meeting these conditions.

The main lift-webs pass through shoulder buckles as used in the Type X harness, and thence lead downwards over the front of the body, each terminating at a quick-release box just above hip level and almost in a direct line below the shoulder. Between these two release boxes a "seat strap" passes down and back round the buttocks; it has twin leg-straps attached near the centre at the back, and these are passed forward between the legs and thence return to the quick-release boxes.

Each quick-release box also forms the terminal point of a cross strap which passes upwards across the chest to the opposite shoulder buckle, and thence down across the back to the seat strap.

Attachment of the pack is similar to that of the Type X assembly, and D-rings on the chest lift-straps are provided to carry the reserve parachute assembly. Attachment and detachment of the reserve assembly are the same as on the Type X harness. Operation of the two quick-release boxes results in complete and immediate divestment of the whole harness.

The principal safety-factor is the duplication of the quick-release boxes. Should either fail or become inadvertently released, the man will still be held securely in the harness and suspended on both lift-webs, although one will become a little longer than the other. The principle of carrying primary loads through a quick-release box is already accepted in other applications and the duplication of quick-release boxes as a safety measure is considered sounder in this application than, say, in the case of twin canopy-releases above the shoulders.

It is further claimed that the cross straps on the chest provide security of the harness without the necessity of a waist belt, and that there is no tendency for the harness to slip off the shoulders.

Gas-turbine Fuel Atomization. The National Gas Turbine Establishment contributed a fuel-atomization exhibit. With few exceptions, it was pointed out, it is usual to find that the better the atomization (i.e., the smaller the fuel droplets) the easier it is to achieve high combustion-efficiencies. In an engine which is sometimes operated at full power at ground level and sometimes idles at high altitudes, the fuel flow-rates required may vary by a factor in excess of 20. For a simple atomizer giving the required maximum flow at 800 lb/in^2 the pressure for the minimum flow would be less than 2 lb/in^2. By the use of spill or multiple atomizers the minimum pressures can be increased and are often of the order of 10 lb/in^2. At such pressures the atomization is poor.

It is usual to pass air in a shroud around the atomizers to reduce carbon deposits, and the Farnborough exhibit showed modified shrouds in which the shroud air is used to assist atomization. The importance of swirling the air was demonstrated. Unswirled air tends to close the "bubble" produced by atomizers operating at low fuel pressures. Swirled air opens the bubble and makes a better spray, and also increases the relative velocity of fuel and air.

Radar Reliability. At present there is no standard of reliability in electronic devices. Reliability can be measured in terms of the number of hours before failure occurs, or as the ratio of the time in useful service to the time out of service for maintenance.

The problems of radar reliability are being studied at the Radar Research Establishment. Much experience has been gained in the past ten years in climatic and vibration testing, in improvements in components and materials, and in new constructional techniques. To test the theories, a complete airborne search radar is being re-designed to achieve maximum reliability. The main design points are: simplicity in the circuits; de-rating of components; use of "potting" techniques; replacement of valves by magnetic amplifiers and magnetic modulators; and re-design for easy replacement of all the units. The exhibit on the M.o.S. stand showed the synchronizer and indicator units of this equipment.

Distribution of Technical Information. Some aspects of the work done by the Ministry in disseminating technical information were demonstrated at Farnborough. It was shown that the Ministry produces a large number of research and development reports, some of which are available through Her Majesty's Stationery Office. Others, unpublished, are distributed through the department known as T.P.A.3/Technical Information Bureau; these go to M.o.S. contractors and to official bodies with a recognized interest in aeronautics. T.P.A.3/T.I.B. also distribute the American N.A.C.A. reports.

Apart from the main collections of British and Overseas reports, T.I.B. hold libraries of German documents, specifications in the aeronautical field, and reports and published articles on servo-mechanisms and on computors. Published articles of interest in the aeronautical field are abstracted in *Index Aeronautics*, which is issued monthly.

The Central Radio Bureau (T.P.A.3/CRB) provides an electronics collecting and distributing information service, holding in its library several thousand unpublished reports, indexed under radio, radar, communication and allied subject-headings.

In addition to "accession lists" provided for Government Departments, a list is sent out regularly to the electronics industry. This gives a guide to unclassified information which is regarded as "by-products of military research and development." The reports listed therein may be obtained on loan or for retention on payment of the copying charge. Standardization of graphical symbols and terms for electronic subjects within the Services is also dealt with.

"OPERATION ELBA ISLE"

A Naval Officer's Story of the Salving of Comet G-ALYP

SEVERAL fairly informative accounts of the salvage operations by which the wreckage of Comet G-ALYP was retrieved from the Mediterranean sea-bed early this year were printed and broadcast at the time; but not until the other week did we see a narrative that conveyed the real measure of the difficulties that faced the Naval search and salvage crews. It appeared under the title "Operation Elba Isle" in the September issue of *Blackwood's Magazine*, and extracts are published here by permission. The author is Cdr. Gerald Forsberg, who was in charge of the salving.

During the period of nearly three months covered by the story a number of Her Majesty's ships and of Italian trawlers took part, for greater or lesser periods, in the search and the subsequent liftings, but one of those principally engaged was the Royal Fleet Auxiliary salvage vessel *Sea Salvor*, and she figures largely in the events that make up Cdr. Forsberg's story. He tells it competently, and with flashes of humour which somehow never obtrude on the tragic background.

The wreckage, it may be remembered, was lying on mud, 400ft below the surface, and in a position only vaguely estimated from conflicting reports. Very soon after the Admiralty had ordered the operation to be launched, H.M.S. *Wrangler*, a fast anti-submarine frigate, was surveying the area with asdics, questioning eye-witnesses and organizing the local fishermen into some systematic trawling. A few days later, having loaded the necessary search and salvage equipment, including a television camera flown out from England, H.M.S. *Barhill* and *Sea Salvor* arrived on the scene; the date was January 25th.

H.M.S. *Wrangler* was in due course relieved by H.M.S. *Wakeful* and it was the latter vessel which, on February 12th, reported that a piece of Comet wreckage had been sighted by television. In the meantime, incidentally, all the ships had been constantly harrassed by high winds and rough seas.

Now the heavy work began in earnest. As well as television, *Sea Salvor* carried an oxygen-fed observation chamber in which a man could be lowered. Mooring in exactly the required position, and retaining that position, was one of the problems. "When salving," writes Cdr. Forsberg, "the ship would have to moor securely with at least six wires leading in different directions. The Italians, who have become rather expert in deep-sea salvage, use eight mooring wires at forty-five degree spacing.

"Anyway, call it a requirement for six wires and six winches to start with. Naturally, the television camera—or the observation chamber—needs another one of each. Likewise a heavy weight must be lowered into the vision of camera or chamber. Otherwise, the observer cannot ascertain the direction into which he is looking. Total of eight, so far! Two more for the grab and one for the derrick topping-lift. Altogether, a minimum requirement of eleven, if a rather shaky mooring is acceptable." It was providential to discover, adds Cdr. Forsberg, that *Sea Salvor* carried just 11 deck-hands, or one per wire.

On February 12th, one of the few really fine days, *Sea Salvor* cruised dead slow up and down the contact area. It had to be at minimum speed, or the camera would have come flying off the bottom like a kite on a string. Despite that, *Sea Salvor* steamed many miles up and down a three-hundred-yard square that day; for, because the camera sweeps a path only twelve feet wide, it was necessary to go over that square time and time again.

"As it happened, we were lucky. There was thrill after thrill—sighting after sighting. The only annoying thing was that really big pieces seemed non-existent; the bottom looked as though someone had up-ended a waste-paper basket. Therefore, we did not lay out our moorings immediately; for had we done so it would have meant either playing hide-and-seek round our own anchors and cables, or simply stopping further search for a quarter-mile or so all round us. True to form, the wind blew itself into a howling gale again next day."

On the 19th, after more bad weather, *Sea Salvor* secured herself to moorings laid out by *Barhill* and "the stage was set for the real Act One to begin . . . Like all long-awaited events it was something of an anti-climax. The ace diver, John Galpin, tracked a tangled trawl-wire straight to a piece of wreckage. He was so quick that we had not fully begun to enjoy the chase before he was there. Up came his observation chamber, down went the relief diver, Tom Bray, to guide the grab—and up came the grab with a fair-sized piece of wreckage. It was just about as quick and straightforward as the writing of it."

Three days later, after further work on the spot had proved unfruitful, *Sea Salvor* got one of the trawlers to lay a plain trawl-warp in a circle and bring the ends back to her: " . . . the world's most elementary trawl—no nets, no otter-boards, no weights except a few bits of chain, really a desperate last resort. Perhaps you are beginning to guess what happened.

"The chain caught round a chair from the Comet, the chair caught round some electric cables, the electric cables were attached to the after pressure-dome. We carefully dragged the whole issue to within twenty feet of the surface. Then, fearing to push our luck another inch, an ordinary soft-suited diver was sent down to get a stout sling round it. Within an hour it was safely on deck. We had rescued the ladies' and gentlemen's toilets from four hundred feet below surface. It was with curious feelings that we read familiar English trade names and notices . . ."

That week 12 grab-loads of wreckage, all from the after end of the fuselage, were brought up—"then the vein ran out."

Gales forced the ships to leave the area and seek harbour, and it was not until March 1st that operations could be resumed: "There were no moorings ready for *Sea Salvor* to pick up, so off we went to do a bit of televising. Unluckily there was the residue of a big swell. The pitch had some bumps on it which had escaped the heavy roller. It was not a very big swell—roughly, twelve feet from head to toe. But it was just enough to raise the television camera too far off the bottom to see anything. At least, that was at one moment; at the next moment the unhappy camera got its face dipped in the mud, and we saw even less."

But during the next fortnight little was found; the weather turned again, and all but *Sea Salvor* were driven to seek shelter. On March 15th, in kinder weather, the diver was lowered in the observation chamber and soon reported that "he had seen the biggest piece of Comet ever."

Down went the grab, and "when, at last, it re-emerged from the sea, normally taciturn men shouted with delight. The rear spar (or girder to laymen) was all there, with numbers of jagged projections. The spar itself was about sixty-five feet long, by two foot six inches, and the projections made it an awkward customer to deal with. By pulling, hauling, twisting, coaxing and swearing, it was finally stowed inboard. A number of people then felt like relaxing and having an excited chat about the great new capture; but the diver and grab were waiting inexorably for the next dip. This time the grab brought up what looked like the twin of the last lift. Only this was the front spar, and it was bigger.

"This spelt finis for *Sea Salvor* for the day. Her decks were so encumbered with wreckage that winch-working was quite out of the question. Despite the fact that the diver had by now sighted two jet engines on the bottom, she reluctantly had to slip her moorings and return to harbour. There the ever ready *Barhill* went alongside her and took the tangled mass away."

A few days later one of the Comet's engines was raised, then the starboard undercarriage, and a rich harvest of "small and not so small items . . . Bits of wings, flaps, engine cowlings, tail plane; and engine components, wireless sets, flight instruments; all steadily adding to the amount of aircraft recovered. One trawler picked up an expensive camera on one lap; on the next she got the light-meter to go with it."

On March 30th *Sea Salvor* had another major find. Docherty, in the diving-chamber, identified another large object: " . . . Victor Campbell started the lift going. As soon as it started we could see it was heavy by the strain on the grab wires. It seemed hours hauling up that seventy fathoms of wire. And when the load did heave in sight, it looked enormous. It was so enormous, in fact, that it was not true. The optical illusion was caused by mud discoloration. Mud was washing off the wreckage and not mixing properly with the sea-water. At about five fathoms below the surface this clear-cut halo of mud gave gigantic proportions to the recovery. As it came farther up, it shrank and shrank. But even then, when it emerged from the sea, it was the biggest single lift of the operation—the entire forward end of the Comet. Cockpit, flying controls, fire indicators—from the nose right back to the wings."

"Operation Elba Isle" was now drawing to its close. On April 9th Cdr. Forsberg was due to sail for Malta, leaving the trawlers to do the final gleaning. As he stepped on to the bridge a signal was put into his hand; it read: "To *Eagle* and *Daring* from Commander-in-Chief, Med. Proceed to search for B.O.A.C. Comet G-ALYY missing on flight from Rome to Cairo."

And these are the words with which the author concludes his narrative: "No thought of the hard work we had done entered our minds. Nor any thought of the more difficult task to come. In three months the Comet had entered our affections so much that we felt that it and we belonged together. Our feelings of sympathy went straight to the designers, manufacturers and operators . . . Courage is an essential for world leadership. Now indeed they would require it in full measure."

Antarctic Air Exploration

Pioneer Flights and Discoveries of Wilkins, Byrd and their Companions

By ARTHUR SCHOLES, F.R.G.S.

IT took more than two centuries for adventurous maritime navigators to delineate the coastline of North America, but in thirty-five years air explorers have completely mapped the outline of the southern continent of Antarctica.

The frozen land mass of the Antarctic continent is spread over an area of six million square miles. Shaped like an upturned saucer, it is equal in size to the combined areas of the United States of America and the Commonwealth of Australia. Atop the saucer is the polar plateau, rising to an altitude of 9,000ft at the South Pole.

Surrounding the flat plateau are mountain ranges as long as the Himalayas and rising to 20,000ft into the still air. Glaciers sweep down for hundreds of miles until they jut out over the sea as vast pontoons of floating ice, which break off to form the big flat-topped icebergs that float northward to melt in the warmer waters.

Antarctica, whose coastline was first mapped in 1840 by Lt. Wilkes of the United States Navy, was the last continent to be discovered, and the only one to be mapped entirely from the air. Credit for the aerial exploration of Antarctica must be distributed on an international basis, with the major share going to the aviation pioneers of U.S.A., Britain, Australia, Norway, Canada and France. Russia, as far as the records show, has played no part in the mapping of the southern continent, and of the other European nations Germany has less claim to participation than other countries.

Of the air explorers the first names that come to mind are Byrd, Wilkins, Mawson and Ellsworth, but there were others whose names have been forgotten in the rush of events during the last three decades.

The first man to fly in the Antarctic was a forgotten balloonist with Scott's *Discovery* in 1902. For hundreds of miles Scott had coasted along the ice barrier, which he believed to be afloat, and had then come to indisputable proof of high land. Scott thought that somewhere the floating barrier must end and the land begin; so he looked for an inlet he had seen on the way east and steamed into it, making-fast to an ice-wall twenty feet high. It was here the captive balloon was sent aloft.

Scott called the bay Balloon Bight, but no other expedition ever saw it as he did, for the ice which formed the bight broke out to make the larger Bay of Whales. Later, Shackleton ascended there in a balloon to see as far as possible to the south of the barrier edge. He saw that the surface to the south rose in gradual undulations, and a bank of cloud that had all the appearance of dry land.

It was his knowledge of the value of reconnaissance aircraft in World War I that led Sir Ernest Shackleton to take an aeroplane—an Avro Baby seaplane—on his post-war expedition. The pilot was a New Zealander, Roddy Carr. But a few weeks after exploration vessel *Quest* entered Rio de Janeiro harbour, on November 21st, 1921, Sir Ernest collapsed and died in his cabin. The little seaplane never flew in Antarctic skies.

Nevertheless, Shackleton—restless, enterprising and perhaps the most dashing figure of all Antarctic exploration—had indicated the path. His successor was George Hubert Wilkins, who had joined the Australian Flying Corps in World War I, and became commissioned and decorated. Among pilots flying in the Middle East he met Frank Hurley, and this contact was probably the spark that set Wilkins off on his Antarctic wanderings, for Hurley had been in the south with Mawson and Shackleton.

During the first of his Antarctic expeditions Wilkins pointed out that the importance of the continent lay in the fact that it played a very large part in controlling the weather of the southern hemisphere. His ultimate aim was to place twelve meteorological stations in suitable places within the Antarctic Circle, and to keep three weather ships in these waters to study the sea and air currents. His immediate plan was not to establish an elaborate land base but to make short expeditions during the summer months and with a small party to fly over as much of the coastline as possible before weather conditions forced his base ship northwards.

His first experience of Antarctic exploration had been in 1920, when he was associated with the British Imperial Antarctic Expedition under the leadership of J. L. Cope, who planned to take twelve old R.A.F.

A blizzard hits the Australian meteorological and research base on Heard Island. Wind speeds exceeded 100 m.p.h. on eleven occasions during one winter in recent years.

Sir Hubert Wilkins (left) and Sir Douglas Mawson. The latter's first visit to the Antarctic was with Shackleton in 1907.

ANTARCTIC AIR EXPLORATION . . .

surplus bombers to King Edward VII Land, and from there make a flight to the South Pole; Cope's idea was to use the aircraft in relays, abandoning them on the way according to the distance they covered. But the organizers were unable to obtain support for the project, and the machines were returned to the R.A.F. Wilkins went south with Norwegian whalers.

He did not again visit Antarctica until 1928, when he led the Wilkins-Hearst Expedition to Graham Land. Accompanied by four companions, he took two Lockheed Vega monoplanes, which could be used with wheels, skis or floats. The party sailed from Montevideo in the 15,000-ton whaling vessel *Hektoria*.

The first flight in Antarctica was made by Wilkins on November 16th, 1928. Ten days later both the Vegas flew for several hours in various directions, looking for a better landing ground. An examination was made of the islands to the north, including Low, Snow and Livingston Islands, but Wilkins failed to find a better location.

The Australian tried to use one machine as a seaplane, but it would not take off with a full load. This made it quite impossible to fly from Graham Land to the Ross Barrier, as originally planned. Wilkins had intended to fly to a more southerly base in the Weddell Sea, whence one machine would proceed to the Ross Sea and the other would return to Deception Island. To do this, however, meant that both machines would have to be fitted with skis. Wilkins then passed between C. A. Larsen's Foyn Land and the coast and saw two conspicuous black mountains, which he named Mt. Napier Birks.

On January 10th, 1929, another long flight was made. Floats were used and Wilkins flew about 250 miles along his previous course in an endeavour to find a more southerly base accessible by boat. Clouds, however, obscured the land below 4,000ft. After storing the two machines at Deception Island, the party left for the Falkland Islands. Wilkins received a knighthood for his explorations.

These mountain ranges in Queen Maud Land were first photographed from the air during the German expedition of 1939; more was learned about them when the Tiger Moths of the Anglo-Scandinavian expedition flew over them in 1950.

Sir Hubert next approached the United Kingdom Government, who agreed to make the whale-catcher *William Scoresby* available and to provide £10,000. Sir Hubert took with him four companions, a caterpillar tractor, an outboard motor-boat and a small car. They sailed in the Norwegian whaler *Melville*, intending to carry out the plan of the previous year, but on arrival at Deception Island conditions were found to be unsuitable for long flights and the aeroplanes were embarked in the *William Scoresby*.

Although the ship cruised as far south as 67 deg 30 min, no suitable pack-ice could be found to enable a flight to be made with the ski-planes. Wilkins decided to use floats, but found it necessary to return north to Neumayer Channel before sheltered water could be found. When the ship was in latitude 67 deg S, longitude 75 deg W, a flight from the sea was attempted.

On December 25th, 1929, Sir Hubert took off with S. A. Cheeseman as pilot. But a snowstorm compelled their return when, according to Sir Hubert's calculations, they had almost reached Charcot Land. On the following day, Charcot Land was reached on another flight and seen to be an island. They circled it and discovered a small island a few miles to the north. Alexander I Island, as it was then called, could be seen to the east, between latitude 69 deg 30 min S and latitude 70 deg 30 min S. To the south they could see low, sloping, snow-covered land, starting from a dim cliff outline about thirty miles away. This land was visible as far as longitude 80 deg W, and appeared to be the coast of the mainland.

The party remained at Deception Island until the *William Scoresby* returned on January 25th, 1930. In the hope of meeting improved weather, the vessel pushed west, past Peter I Island. More flights were made. On February 1st, 1930, they flew due south to latitude 73 deg, S, but no land was seen.

Sir Hubert made his fifth journey to the Antarctic in 1933. The expedition was planned and financed by Lincoln Ellsworth, son of a Chicago millionaire coal owner, and a World War I pilot. The Australian went as adviser and reporter. It was intended to make a 3,000-mile flight from Little America, in the Bay of Whales, to the head of the Weddell Sea and back, extending to fifteen days if necessary, in order to make a rough survey of this portion of the continent. They left New Zealand in the motor-ship *Wyatt Earp*, carrying a low-wing Northrop monoplane named *Polar Star*. Bernt Balchen, later to gain such fame as a polar flier, was the pilot.

The Bay of Whales was reached on January 6th, 1934, and five days later a trial flight was made. It was a complete success, but bad weather intervened, and a week later the ice, which was fifteen feet thick, broke up for a distance of five miles from the ship. The skis of the aircraft, which was standing on the ice, slipped through a crack, and it was only after six hours' dogged work by ten of the fifteen men comprising the expedition that the Northrop was recovered; but it had to be returned to its American makers for repair. The expedition returned to Dunedin, New Zealand.

As October and November are considered the best months for flying in the Antarctic, Ellsworth decided the following season to fly from Deception Island, which was accessible in those months, to the head of the Weddell Sea, and thence to the Ross Sea, a total distance of 2,800 miles. He would then wait at the Bay of Whales until Sir Hubert Wilkins arrived in the *Wyatt Earp*.

During the winter the *Wyatt Earp* remained at Dunedin for repairs to her rudder and engines. By the middle of September 1934 Ellsworth and his companions were back in New Zealand with the Northrop. They reached Deception Island, but, before a flight could be made, a connecting rod broke and the ship had to return to Magellanes, Chile, for a new one. She was back at Deception Island on November 17th, but by now the snow on the runway had melted and it was no longer possible to use skis.

The ship left Deception Island and cruised down the west coast of Graham Land to Port Lockroy. The vessel then proceeded to the east coast, where good landing grounds were found on Snow Hill Island, near the cabin built by the Swedish explorer, Nordenskjold, in 1902.

On January 3rd, 1935, *Polar Star* flew to the south along the east coast of Graham Land; but cloud and snow squalls ahead forced the aircraft to return to Snow Hill Island after being airborne for several hours.

Dundee Island was selected for the next attempt, and Ellsworth and Sir Hubert returned there in the *Wyatt Earp* in November 1935, after calling at Deception Island, where the Northrop Gamma was assembled. On November 20th, Ellsworth and H. Hollick-Kenyon, a veteran Canadian pilot, started their flight to the Ross Sea in fine weather. Misfortune continued to dog them. Their oil-gauge broke and they were obliged to return from latitude 65 deg 30 min S. Next day they set out again and had flown almost 600 miles and were just entering the unknown region beyond the point to which Sir Hubert Wilkins had flown in 1928, when very heavy clouds made it necessary to

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ANTARCTIC AIR EXPLORATION . . .

return once more. Before turning back, they discovered a lofty range of mountains to the south, which they named Eternity Range.

On November 23rd, Ellsworth and Hollick-Kenyon took off from Dundee Island, into an almost cloudless sky, on their remarkable trans-continental flight. They flew south along the east coast of Graham Land for 500 miles.

Flying at 13,400ft, they saw the rugged peaks of the Eternity Range ahead of them, more than a hundred miles long and rising to 12,000ft. They looked down upon a vast snow plateau; they were the first men to visit Western Antarctica.

Ellsworth gave the name James W. Ellsworth Land to the region between longitude 80 deg W and longitude 120 W. They landed at night and camped in the aircraft. Next day they took to the air again, but poor visibility forced them to land after thirty minutes. At midnight on November 27th they started once more, but bad weather reduced visibility. They landed after an hour's flying. Later a blizzard hit them. It blew for days and, when it finally cleared, it took them another day to free their aircraft from its blanket of snow.

On December 4th they came down 160 miles from Little America. On the next day they flew until shortage of fuel compelled them to land at the north end of Roosevelt Island. After six days' marching, Little America was reached, where they settled down to wait the arrival of Wilkins. On January 16th, 1936, a rescue party from the research vessel *Discovery II*, which had left Melbourne on December 24th, 1935, reached Little America and found them both safe. *Discovery II* carried a Moth and a Wapiti, and it was the Moth pilot who first sighted the missing men.

Ellsworth decided to return to Australia in *Discovery II*, while Hollick-Kenyon remained to salvage *Polar Star*. The success of this flight goes down as one of the greatest achievements in Antarctic exploration.

In October 1938, Ellsworth left Cape Town in the *Wyatt Earp*, planning to fly 500 miles inland into Enderby Land on the Indian Ocean coast, across a vast unknown area towards the South Pole. If conditions were favourable, the flight would be continued to the Bay of Whales in the Ross Sea. He was again accompanied by Sir Hubert Wilkins, and this time they took two aircraft, a Northrop Delta and a little Aeronca.

Wyatt Earp remained in the ice-pack and cruised for sixty-five days until open water was reached off Princess Elizabeth Coast. The Antarctic ice-cap was seen from the crow's nest when the ship was at latitude 68 deg 24 min S, longitude 73 deg 42 min E. Next morning a flight was made and from an altitude of 5,000ft the edge of the barrier from Cape Amery to the Vestfold Mountains was visible.

The ship lay off the Vestfold Mountains, but the ice was not suitable for a landing field, so she was moved to near the Rauer Group of Islands on January 4th, 1939, and moored against the edge of the ice between the islands and the mainland.

On January 8, Sir Hubert flew the Australian flag on the northernmost island of the Rauer Group and left a record of his visit. Next morning a large section of the ice broke away, so it was decided to proceed to the east. Sir Hubert went ashore at the west end of the Vestfold Mountains, on what appeared to be part of the mainland.

A Sikorsky S-51 helicopter, based on an ice-breaker, made reconnaissance flights during Admiral Byrd's Antarctic expedition of 1946-47.

Alongside the flat coastal ice the ski-plane was unloaded and prepared for inland flight. Ellsworth set out with J. H. Lymburner as pilot and, flying southward, reached latitude 72 deg S, longitude 79 deg E, before returning. To the south of the islands fronting the continental ice was an area of crevasses extending fifty miles inland. Ellsworth was surprised to find no mountains, for the elevation of the ice surface increased gradually and the plateau became one unbroken surface over which visibility extended for 110 miles. No colour or contour relieved this apparently limitless expanse of ice and snow. The plateau at the most southerly point was 7,500ft above sea-level.

The *Wyatt Earp* emerged from the pack, making port at Hobart on February 4th, 1939.

It was Douglas Mawson, a young geologist, of Adelaide, South Australia, who blazed the aviation trail in the region south of Australia. In 1929-31 on two expeditions with Scott's old *Discovery*, Mawson charted 2,000 miles of coastline from the Ross Sea to the 100ft high ice-cliffs of MacRobertson Land. Mawson used a float-fitted Tiger Moth and his pilot was Stuart Campbell, of the Australian Air Force.

While Mawson was mapping the land westward of the Ross Sea, Admiral Richard E. Byrd made the first flight to the South Pole from his base at Little America. Byrd's pilots made different sorties east, south and west of their base, plotting King Edward Land, which had been seen first by Scott.

Byrd returned to the Antarctic on four different occasions. In 1946-7, he made his second flight over the South Pole, and was assisted in his operations with a U.S. naval task force of 13 ships and 4,000 men.

In 1948 Australian expeditions photomapped Macquarie and Heard Islands and established weather stations on these frozen outposts. In 1950 the British-Norwegian-Swedish joint expedition, with which went two R.A.F. Austers, completed the mapping of Queen Maud Land.

On the other side of the continent Finne Ronne's expedition, operating from Marguerite Bay, completed the mapping of Graham Land (Palmer Land) which had been pioneered in 1935 by John Rymill, an Australian, in a float-fitted Moth. Finne Ronne mapped the last unmapped portion of the Antarctic coastline.

These photographs were taken during the Anglo-Scandinavian expedition in 1950, when the R.A.F. provided two Auster 6 aircraft and crews. The group picture shows an historic occasion—that on which the R.A.F. ensign flew for the first time in the Antarctic.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Those Croydon Complaints

THOSE who have the interests of private flying at heart will have learned with dismay that the Croydon Airport Consultative Committee wrote on September 16th to the Minister of Civil Aviation asking him to take immediate steps to curtail "annoyance and inconvenience" caused by flying clubs.

It is probable that the low flying is done by aircraft not based on Croydon at all, and possibly not light flying club aircraft either. Flying clubs are a very convenient and vulnerable target and the trouble is that this business of complaining about noise can be very infectious. Other clubs may find themselves under criticism of this kind.

What these people fail to realize, when they complain about noise, is that they can either have their own country's noisy aircraft overhead—or very soon will have someone else's even noisier aircraft overhead.

I, for one, regard the quiet puttering of a light aircraft as an audible symbol of peace.

Croydon Airport, Surrey. NOEL JACKSON, F/Lt.

Surviving DC-2s

IN your issue dated November 21st, 1952, you recorded that two DC-2s had crashed in South Africa. You also stated that the only remaining DC-2s were in Finland, Guatemala and the United States. To-day [August 1st], when I visited Bankstown Aerodrome to watch the start of the Redex Light Aircraft Trial, I noticed, among other interesting and rare aircraft, a DC-2, registered VH-CDZ. This aircraft was wearing the colours of Marshall Airways, a local charter airline which gives Sunday joy-rides.

Perhaps other of your many readers in various parts of the world may know of other DC-2s. A history of this famous aeroplane, written by J. M. Bruce or John Stroud, would be a most welcome feature in your excellent magazine. Perhaps you could start a history of famous transport aircraft as a complement to your superb histories of military aircraft.

Woollahra, N.S.W. MALCOLM M. LAWRIE.

[We believe there is another DC-2, dismantled, in one of the hangars at Bankstown.—Ed.]

Women in Aviation

I FEEL I should answer Mr. Harper's comments [Correspondence, September 10th] on my article on "Women in Aviation," which appeared in *Flight* of August 20th.

Mrs. Hart O. Berg certainly deserves recognition as the first woman to fly in a *Wright* aeroplane, which she did in September 1908, Wilbur Wright having brought his aeroplane to France and having made his first flight there in August of that year. Nevertheless, my researches have revealed that Madame Peltier made her flight in a Voisin piloted by Léon Delagrange at Milan in *July* 1908. It was, indeed, a short hop, but so also was the first officially recognized flight which Orville Wright made on December 17th, 1903.

Mrs. Hart O. Berg and Mrs. Assheton-Harbord were only two of many omissions. It would require at least a special issue of *Flight* to do justice to all the women who have contributed to the progress of aviation.

London, W.14. PATRICIA STROUD.

Boscombe Down—War Memories

SO that is Boscombe Down! If the recent tweaking of the security curtain that shrouds A. and A.E.E. gratify the public, it must interest in a different way those who, like myself, were stationed there in war-time. Acres of runway, a blower tunnel —how things have changed since the early '40's! And we read also of ultra-modern billets, with every mod. con., in contrast to the rash of hutments in the lower camp and the solid barrack-blocks of the upper.

Yet the erk who stumped up the hill from Amesbury in the blackout must have felt, even then, that this was one of the nerve-centres of Britain's air effort. There were aircraft whose names must not be mentioned outside the camp—now mere relics of flying history—and there were new ideas with varying starriness of priority. Rush jobs and frustrating delays—even one whose part in the big machine was little more than a 2 B.A. nut could sense that the activities of "A.Per," "B.Per," and the rest (they were performance-testing *flights* in those days, I seem to remember) were all meant to be leading somewhere, though often it seemed remote from the din of battle and the might of 1,000-bomber raids. But it is good to see, still in the honours list of test flying, the names of pilots who put our war-time aircraft through their paces at Boscombe Down.

Farnborough's record has been chronicled, but I suppose the story of Boscombe Down in those hush-hush days must stay locked up in the memories of rehabilitated civilians like myself, with not even a reunion to revive the lighter legends.

Leeds. EX-CORPORAL.

Fatigue Life

NOWADAYS, in aeronautics, structural fatigue is considered a very important aspect of design for adequate strength—especially in airliners, which are expected to have a longer life than other types.

On the other hand, in the days of the first world war, whilst the designers were not altogether oblivious of this phenomenon, the factor must seldom, if ever, have entered into their calculations. For one thing, there was no data available in a form in which it is employed by the modern aircraft engineer; and for another, a greater part of the structure was wooden anyway. Thirdly, it is doubtful if a flying life comparable with that of the modern aircraft was considered likely in those days.

From this point of view, therefore, it is interesting to reflect on the possible effect of fatigue on the few pre-1930 aircraft that remain with us whose structures contain important metal components, when equated to the number of hours they have logged over the years. It would be interesting to learn whether any failures to these components have occurred that might be attributable to fatigue.

It would also be interesting to know, in view of the value of these souvenirs of an earlier era, whether anyone thinks it worth while investigating ultimate strength and/or flying life with this criticism in view.

Chislehurst, Kent. M. C. HALL.

"Maximum Cards"

WITH reference to the K.L.M. card illustrated in your issue of September 10th, some *stamp collectors* attach a novelty value to maximum cards. *Philatelists* are very serious-minded people who immerse themselves in the study of flaws, errors, re-entries, perforations, watermarks, shades, and are much inclined to snort at pretty pretties such as "cancelled to order" items, maximum cards, etc. Collector's piece indeed!

Incidentally, the postmark concerned is "Wittebrug" (White Bridge) not, as you print, "Witteburg" which looks to me more like "White City" and quite obviously shows that *Flight* is going to the dogs! JOHN FORD.

Chairman, B.O.A.C. Speedbird Philatelic Club.

Hampton Hill, Middx.

IN BRIEF

Mill Hill and Hendon Historical Society is seeking to enlarge its collection of printed material, photographs and other items relating to the early history of aviation in Hendon, and particularly at the aerodrome (which is shortly to be closed). Any useful data of this kind—especially early issues of *Flight*—would be welcomed by the Society, the hon. editorial secretary of which is Mr. Arthur G. Clarke, 23 Parkside, London, N.W.7.

FORTHCOMING EVENTS

Oct. 2. S.L.A.E. S.E. Area: "Sperry Gyroscopic Instruments," by P. Hobley, M.I.N., C.S.L.A.E.
Oct. 11. Institute of Transport: Presidential address by Sir Gilmour Jenkins, K.C.B., K.B.E., M.C., M.Inst.T.
Oct. 12. R.Ae.S. Section Lecture: "Behaviour of Light Alloys at Elevated Temperatures," by B. C. Gadd.
Oct. 13. Radar Association: "The Decca Navigator," by G/C. E. Fennessey, O.B.E., and H. G. Hawker.
Oct. 15. Rochester Flying Club: Annual dinner and dance, Bearsted.
Oct. 15. Helicopter Association: "Application of Gas Turbines to Helicopter Propulsion," by J. Brown.
Oct. 15. The Airlines Ball, Royal Albert Hall, London, 8 p.m.-2 a.m.
Oct. 19. R.Ae.S. Graduates' and Students' Section: "The Propeller-Turbine in Airline Service," by T. M. Corson.
Oct. 21. R.Ae.S. Main Lecture: "The Development of Reheat," by J. L. Edwards.
Oct. 26. Institute of Transport: Visual aids meeting: films on air transport.
Oct. 27. Institute of Welding: Annual dinner.
Oct. 27. British Institution of Radio Engineers: Annual general meeting, and presidential address by Rear Admiral Sir Philip Clarke, K.B.E., C.B., D.S.O.
Oct. 28-29. Institute of Welding: Presidential address by Mr. R. G. Braithwaite, M.I.C.E., and discussions on papers dealing with welding and materials.

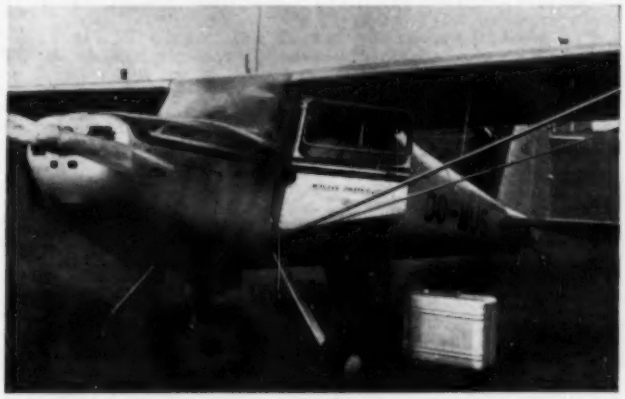
Mr. and Mrs. R. Meyer (Switzerland) are greeted on arrival at White Waltham in their smart Ryan Super 260 Navion, HB-ESG.

International Sociability

Some Pictorial Impressions of the R.Ae.C Invitation Rally

Above, a Cessna 170 from Belgium, taxies-in on arrival (M. and Mme. R. Henkart). Below, A Cessna 140, OO-MUS, brought M. and Mme. P. Nibelle.

AS recorded in our issue of September 17th, 74 guests from nine Continental countries came to White Waltham Airfield in 36 aircraft to take part in the Royal Aero Club's recent international invitation rally. In these *Flight* photographs are seen some of the spick-and-span aeroplanes which took part. The weather was unfriendly for part of the four days, but the visitors gave every appearance of enjoying themselves, especially during a visit to the S.B.A.C. Show. Many of their aircraft were unfamiliar to British eyes.



Insignia on Aeronca Chief OO-GUS (MM. R. and J. Heuvelmans). (Below, left) A K.Z.7 from Luxembourg, with two K.Z.3s from Denmark farther along the line; in the foreground, Luxembourg Tiger Moth LX-JON. (Below, right) Le Chevalier and Mme. de Seillers de Moranville arrive in OO-ESD their maroon-coloured Navion 205.

Civil Aviation

AIRLINE ASSEMBLY

Afterthoughts on I.A.T.A.'s Annual Meeting in Paris

At the closing session of I.A.T.A.'s annual meeting, Mr. Juan Trippe (right) was congratulated on his nomination as the association's president for 1955-56 by the current holder of that office, M. Max Hymans. Looking-on (centre) is Sir William Hildred, director-general of I.A.T.A.

THERE is often vagueness as to the purpose of international associations, partly no doubt because people are not accustomed to the idea of action on a world scale. Another reason may be the fact that it is easier to speak in general terms of the value of international co-operation than to explain the precise advantages of unified action by groups of different nationality—especially when those groups are of essentially competitive character.

Probably the largest and most effective international commercial body is I.A.T.A., the International Air Transport Association. While I.A.T.A. itself is quite clear about its objectives, and finds no difficulty in defining them, this cannot always be said for the rest of the aviation world. The annual general meeting of I.A.T.A., which has this year been held in Paris, provides a topical peg on which to hang a few explanatory words concerning the association's purpose as well as its progress.

Rate-making is undoubtedly the most fundamental of I.A.T.A.'s duties. Through the machinery of periodic traffic conferences in different parts of the world, representatives of the 70 member airlines (which, incidentally, are estimated to carry 95 per cent of scheduled international traffic outside Russia and China) fix standard rates for the carriage of passengers and freight on every international route where there is competition between I.A.T.A. companies. It is sometimes inferred that I.A.T.A. is an overriding body with power to dictate the fares which its members shall charge: in fact, the decisions of I.A.T.A. are the decisions of the airlines, and the association is essentially a servant rather than a master.

Through I.A.T.A. the airlines can protect themselves against the financially disastrous effects of over-competition, but this is not the only reason for this method of achieving unanimous agreement on rates. Air traffic between nations is based on a complex arrangement of bilateral agreements, negotiated by the governments concerned, which lay down the traffic rights of national carriers and the amount of capacity which each can offer on a given route. But for the existence of I.A.T.A., which enables the airlines themselves to determine the economic fare for each route, and to vary it according to the fluctuations of operating conditions, governments would also have to deal with fare structures in their bilateral negotiations. The primary reason for not allowing fares to find their own level in a normal commercial way is, of course, the highly uncommercial degree of subsidy, direct or indirect, still present in air transport today.

Whatever its shortcomings, the I.A.T.A. rate-making system is now thoroughly proven and accepted, and consequently greater stress is laid on some of the association's other activities on behalf of the airlines. These are summarized in the reports which the various committees presented at the annual meeting, which took place in Paris from September 13th-17th inclusive.

The longest report was that of the *Technical Committee*, which was presented by its chairman, Mr. P. W. Goldsborough, general manager of communications for T.W.A. Referring to gaps in implementation of the I.C.A.O. regional plans for services and facilities, the report warns members that their chances of having adequate facilities provided by governments would be improved if only they themselves kept the requirements for the number of ground systems to a bare minimum. I.A.T.A. technical groups would then attempt to bring the airlines into agreement on uniform operational requirements for airborne equipment on the basis of whole routes or regions. A delay on the part of one airline in giving up an obsolete ground aid could pose serious problems for other operators. I.A.T.A. attempts to bring about the early introduction of V.O.R. in Europe and to integrate them with existing M.F. aids were "showing signs of fruition but the three problems which remained unsolved were those of (a) more efficient radio telephony; (b) co-ordination of civil and military operations; and (c) standardization of altimeter setting procedures.

The search for an ideal turbine fuel, the report says, had received an encouraging response. Looking into the future, it was intended to present the manufacturers with a specification of a cheap turbine fuel so that engines could be designed to use this fuel.

Of helicopters, it was stated that the airlines had developed and given their specifications to manufacturers, who were obviously set on "delivering the goods in the very near future." To keep pace with them, I.A.T.A. was working urgently upon such questions as: "flight rules for helicopters; the differences between requirements of conventional aircraft and the new vehicles as regards air traffic control, communications, meteorology, navigation, personnel licensing, etc.: and the integration of helicopters and conventional aircraft operations."

Reference was made in the report to a conference held at Barcelona last May on the subject of pilot training. This revealed that there was a high degree of uniformity in training standards and that differences stemmed mainly from government requirements, many of which demanded that excessive time be spent training crews to pass examinations rather than to meet practical operational standards. Recommendations for new licensing rules for mechanics had been made to I.C.A.O.; the I.A.T.A. proposals urged adoption of the idea that responsibility for proper maintenance and overhaul should be vested in the airline itself as a state-approved maintenance organization, without the necessity for the licensing of individual workers, other than those who would actually certify the aircraft for release from maintenance.

One of the more specific subjects dealt with in the report was that of altimeter accuracy. As aircraft began to operate in more and more rarefied atmosphere, the inherent inaccuracies of pressure altimeters were becoming magnified; at the same time the expansion of traffic demanded even more accurate indications of height from the ground and of separation between the various operating levels. It might be necessary in the future to base operating levels on constant pressure intervals instead of expressing them in terms of linear units above the ground, as at present.

Among other problems to which the report attached special importance was the need for establishing future requirements for long-distance navigational aids. The existing traffic-control organization could provide safe separation of aircraft under present conditions, but with future increases in traffic, the airlines might be forced to suffer economic penalties in order to maintain high safety standards. It was also imperative to lower the operating limits within which transport aircraft could land and take-off in bad weather in order to improve the regularity of schedules. Present weather minima represented "the limits to which we can go in the present stage of the art, that is to say, with the manual semi-automatic couplings used to link the pilot with the final approach and landing system at the ground." Another matter requiring investigation was the possibility of extending inter-airline exchange and pooling of overhaul and maintenance equipment and spares. "There are difficulties associated with the solution," said Mr. Goldsborough, "but these difficulties we propose to analyze at some future date, to find out if and how we can save you what we know to be a great deal of your money."

Reports on the past year's *Traffic Conferences* at Honolulu and New York were presented by, respectively, Mr. Ray W. Ireland, vice-president of United Air Lines, and Mr. Hugh B. Main, vice-president of Canadian Pacific Airlines. One of the most difficult subjects discussed at Honolulu was that of seating densities in tourist-class aircraft, which are at present decided on an *ad hoc* basis (a minimum number of passengers being specified

HERE BEGINS THE A.C. AGE!

The one major obstacle to the much-needed change to Constant Frequency A.C. Systems in the air—the problem of satisfactory operation of alternators in parallel—has been overcome by the introduction, by ENGLISH ELECTRIC, of the Sundstrand Constant Speed Alternator Drive.

This Drive, in full and increasing production in the U.S.A. for several years, is in regular squadron service in the United States Air Force.

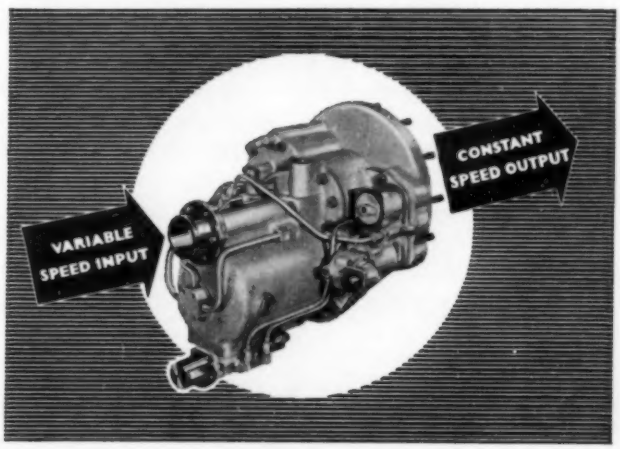
Now ENGLISH ELECTRIC, by manufacturing the Drive under licence in this country, are to add their own unrivalled experience in the design and engineering of A.C. power systems to the development work and production know-how of the Sundstrand Machine Tool Co. No organisation in this country has wider experience than ENGLISH ELECTRIC in the design and construction of all the component parts of constant frequency A.C. systems—alternators, transformers, switchgear, motors, etc.

THE SUNDSTRAND DRIVE

This constant-speed drive is a brilliant adaptation of an old and well proved system—the variable-angle hydraulic swash plate pump and motor—with this difference, that in the Sundstrand design the hydraulic unit is used differentially to add to, or subtract from, the input speed so as to maintain an output speed constant to 1% plus or minus over a speed range of 3 to 1.

WHAT THE A.C. AGE MEANS

Compared with D.C. Installations Constant Frequency A.C. Systems are much lighter, simpler, more reliable and efficient. High altitude operation does not involve the serious design problems and operational troubles as encountered with D.C. Equipment. The inherent simplicity of the A.C. Squirrel Cage motor is such that maintenance costs are enormously reduced if not altogether eliminated.



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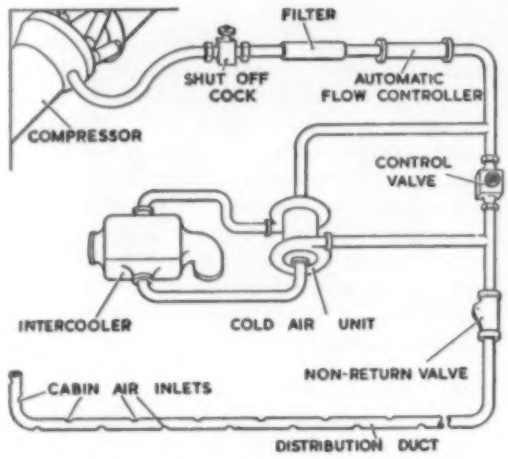

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Automatic Flow Controller

This simple and robust flow control unit has a particular application to aircraft pressurisation supply systems which incorporate turbine/compressor cold air units. It is designed to provide, automatically, the air flow necessary for the efficient operation of the cold air unit without the need for additional and special mechanisms to prevent over-speeding of the turbine. The automatic flow controller also regulates the cabin air supply to a given required value when the cold air unit is out of circuit. As indicated above, this unit is normally intended for systems in which the cabin air supply is obtained by tapping the compressor casing of a jet engine.

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CIVIL AVIATION . . .

for each type of aircraft, regardless of local conditions). It proved impossible, however, to find any other acceptable basis upon which operators may determine the degree of comfort (or discomfort) offered to tourist-class passengers and the question is to be tackled anew at another Traffic Conference in Venice next month.

Despite objections from many carriers, it was agreed at Honolulu that the use of "mixed-class" aircraft would have to continue and regulations were drafted to minimize the "abuse inherent in this type of operation." Honolulu, said the report, would be remembered as the first meeting where proper recognition was given to the importance and future of air cargo. Though holding widely varying views as to the best methods of attracting this class of traffic, operators had patched up their differences in establishing rates for the North Atlantic route.

Like "mixed-bag" aircraft, the establishment of "B"-class fares appears to have been accepted by the I.A.T.A. airlines, if only as an evil necessity. Such fares are normally around 10 or 15 per cent lower than tourist fares and take into account the use of obsolete aircraft, sometimes operating slower schedules than the normal first-class or tourist services operated by larger airlines along the same routes (*e.g.*, the Colonial Coach services flown by British independent companies). Mr. Ireland's report implied that it might not be possible to confine the principle of "equipment differential" fares to those areas where they had so far been adopted; looking around, he saw signs of restiveness in other areas.

This report also referred to the problem of the "no-show"—the passenger who books a seat but does not occupy it. It had earlier been estimated that no-shows cost U.S. and Canadian carriers some $60m per annum but a survey indicated that 80 per cent of no-shows resulted from airline errors or missed connections and other factors not the fault of the passenger. Since the elimination of no-show rules in Europe, the proportion of absentee passengers had increased from 11 per thousand to 57 per thousand. A survey was in progress with a view to establishing effective machinery to reduce the heavy financial losses thus incurred, but it had not been completed in time for the Honolulu conference, and the former no-show resolution, with all its shortcomings, had been readopted.

The main item of news in Mr. Main's report on the New York conference concerned the problem of South American regional fares, which for several years had been fixed by governments and not by I.A.T.A. agreement. In four working days the New York conference had succeeded in settling all first-class and tourist fares in South America and had established "B"-class fares where they were needed. This might mark the beginning of a new and more constructive era in South America as far as regular operators were concerned.

Some of the traffic problems yet to be settled were discussed in the report of the recently formed *Traffic Advisory Committee*, represented by its chairman, Mr. John Brancker, formerly of B.O.A.C. Noting that unproductive travel agents represented an unnecessary expense from the carriers' point of view, and did little but draw business away from the more hard-working agent, Mr. Brancker said that there were still too many agents in Europe, the Middle East and Africa. Though temporary solutions would have to be reached, complete reconciliation of the airlines' widely diverging views on cargo policy was not likely in the near future. There were two schools of thought on air cargo—"one which believes that a general lowering of rates for bulk consignments will attract the greatest market, and the other which believes that the best economic results, together with expansion, can be obtained by the extensive use of special rates for specified commodities." Turning to the subject of air-sea interchange, Mr. Brancker said that there appeared to be far greater possibilities of increasing the scope of traffic between airlines and shipping companies.

An establishment of great practical value to some two-thirds of I.A.T.A.'s members is the Clearing House in London, which enables a high proportion of interline business to be done by offset of debit and credit rather than actual cash transactions. In the report of the *Financial Committee* Mr. Basil Smallpeice, financial comptroller of B.O.A.C., said that the total turnover of the Clearing House in 1953 was $242m (£86m), an increase of 11 per cent on the previous year's figure, the average offset ratio for 1953 being 88 per cent. The cost of this service to members had been only 37 cents per $1,000 of gross receivables.

As reported in the previous issue, the meeting closed with the nomination of Mr. Juan Trippe, president of Pan American World Airways as president of I.A.T.A. for 1955/56. It was decided to hold the next year's annual meeting in the United States. The association's budget for 1955 anticipates expenditure of $956,000 (£355,000), most of which will be subscribed by the 70 airlines which make up I.A.T.A. (the annual due for an associate member is $1,000; active members pay $1,500, plus a variable levy related to their ton/mile output in the previous year).

B.O.A.C.'s YEAR : A FINANCIAL SUCCESS

IT has often been said that airline progress cannot be measured in purely financial terms; this point is strongly emphasized by the annual report of British Overseas Airways Corporation for the year ended March 31st, 1954. During this period the airline suffered its most severe setback: two Comets and a Constellation were lost, breaking a safety record of nearly five years. Even so, the Corporation's development as an efficient trading concern was never before so evident.

The year's operations resulted in a profit of £2m, reduced to £1m by payment of interest on capital; for the first time the Corporation became eligible to pay income tax and profit tax, leaving a final surplus of £700,000. As shown by the figures overleaf, capacity was increased by 6 per cent and the load factor was maintained; at the same time, the number of staff was reduced from 17,798 to 17,255.

Improvements resulting from the Corporation's steady accumulation of experience, its introduction of economic aircraft, and continuity of management under its chairman and deputy chairman, Sir Miles Thomas and Mr. Whitney Straight, are all reflected in the seven-year comparison of results (overleaf).

At the end of the period reviewed in the report, B.O.A.C. were operating 54 revenue-earning aircraft—22 Argonauts, seven Comets, 11 Constellations, 10 Stratocruisers and four Yorks (freighters); revenue hours totalled 135,010—1,628 less than in 1952/53. Two Comets and a Constellation were lost during the year, and a third Comet disaster occurred shortly after the end of the financial year.

Up to March 31st, B.O.A.C.'s investment in the Comet 1 amounted to £5.3m, including development costs. Contracts to the value of £10m had been entered into for Comet 2s and Comet 3s, of which £4.9m had been paid on account. Orders in being or under negotiation for Britannias were valued at £24m, and a B.O.A.C. subsidiary, B.W.I.A., has four Viscounts on order. "Thus," says Sir Miles Thomas in his conclusion to the report, "when spare parts are taken in account, we are supporting the British aircraft industry with orders to the value of £50m."

As to the future of the Comet, Sir Miles was understandably restrained in his answers to the inevitable queries raised at the conference which followed publication of the report. He pointed out that a judicial inquiry into the Elba and Naples accidents was to begin on October 19th, and said that any modifications subsequently made to Comets would have to be followed by a long series of tests. It would be wrong to assume that the Comet would be coming back into service soon. In the report he had paid tribute to the "unparalleled feat of under-water salvage" which had recovered 68 per cent by weight of the Comet lost off Elba.

Other points from the report are summarized briefly below.

The *Eastern Routes*, on which 81m capacity ton-miles had been flown and £14.6m of revenue earned, had seen no major changes. The Corporation was negotiating for a stop at Perth, which hitherto had no direct outlet on international services to the Far East and Europe. Representations were being made to the M.T.C.A. on the need for an airport at Kuwait which could accommodate B.O.A.C. aircraft at all seasons (last year Kuwait was closed to Argonauts by rains on ten occasions).

The *African Routes* accounted for 51m capacity ton-miles and £9.1m of revenue. South African Airways had demonstrated the value of the partnership arrangement by operating the Springbok route almost entirely during the nine-week grounding of the Comets. On the *Western Routes*, B.O.A.C. flew 79m ton-miles and earned £13.4m. Over the North Atlantic there were 15 per cent more passengers than in 1952-53, but despite the increase in tourist capacity, load-factors on the Stratocruiser first-class services were maintained [when more Stratocruisers are acquired from America all B.O.A.C.'s North Atlantic services will be operated by these luxurious double-deck aircraft]. As in the two previous years B.O.A.C. were carrying some 40 per cent of all passenger air traffic between Britain and North America.

The most important *traffic* trend was the increase—from 13.5 per cent to 32.5 per cent—in the proportions of tourist to first-class passengers. The average distance per passenger flown, 3,143 miles, was substantially longer than with any other major international airline.

A drop in *freight* ton-mileage was attributed to the higher proportion of tourist services, with less space and/or weight available for cargo; this was a temporary phase, however, and

CIVIL AVIATION . . .

B.O.A.C.'s results for the financial years ended 1948-54 inclusive compared; in the lower table, last year's figures are given in greater detail.

	1948	1949	1950	1951	1952	1953	1954
Capacity ton miles	89,551,080	116,100,279	133,772,537	158,500,081	190,722,360	208,306,550	220,530,209
C.t.m.s. per a/c hr	551	687	954	1,272	1,372	1,447	1,517
Average block speed	182	185	198	217	221	228	233
C.t.m.s. per employee	3,716	5,256	6,826	9,578	11,632	12,056	12,488
Passengers carried	115,675	142,404	155,557	200,514	250,173	290,629	304,980
Profit or loss* (£)	−7,064,916	−7,308,096	−6,901,032	−3,590,521	+1,233,722	+103,875	+2,012,792
Exchequer Grant (£)	6,560,000	5,750,000	6,350,000	6,000,000	1,500,000	—	—

* Before payment of interest on capital.

Britannias had been designed to carry a good deal of freight whether operating tourist or first-class services.

On the subject of freight, the report contains an important policy statement, which is quoted verbatim below:—

"The Corporation is still of the view expressed in its annual report for 1952-53, that to be fully competitive with other international airlines it must be able to accept whatever volume or type of freight business is offering. It must be free to supplement the capacity available on passenger services by all-freight services where necessary. However, these services need not necessarily be operated by the Corporation if the supplementary freight capacity on any route where it is required can be provided by another British operator in such a way as to ensure that the goodwill of the passenger business stemming from the freight business is preserved to the Corporation.

"Accordingly, upon the expiry in July 1953 of the undertaking given to the Minister of Transport and Civil Aviation not to apply for permission to operate new all-freight services, it was decided to open negotiations with Airwork, Ltd., for collaboration on the North Atlantic route, over which that company had been licensed to operate an all-freight service. Satisfactory arrangements have now been concluded, under which Airwork will carry any freight which cannot be accommodated on the Corporation's passenger services. Thus, the Corporation will be able to accept as much business as is offered to it, and will place its widespread sales organization in North America behind the venture.

"Hunting-Clan Air Transport is seeking permission to operate a 'tramp' type of service to points in Africa, not necessarily on the Corporation's routes. If the application is granted, the Corporation will also assist this venture in any way that is profitable and practical. In the belief that such arrangements are in the best interests of British civil aviation as a whole, the Corporation is ready to discuss similar collaboration with independent companies on other routes."

Subsidiary companies of B.O.A.C. lost a total of £179,484 during the period reviewed, compared with net losses of £30,612 in the previous financial year. This is largely explained by the fact that Aden Airways, which made a £22,817 profit in 1952-53, lost £140,595 in 1953-54. The B.O.A.C. report says that "steps have been taken to reorganize and rehabilitate the company." Other profit-and-loss figures for subsidiary companies (1952-53 results in parentheses) were as follows:—Bahamas Airways −£19,050 (−£14,452); British International Air Lines, Ltd. (a new local operator in the Gulf area), −£2,219; British West Indian Airways, Ltd., −£19,965 (−£39,794); Gulf Aviation, Ltd., +£89 (−£4,062); International Aeradio, Ltd., +£2,256 (+£4,879). The losses, the report remarks, "represent a price which must be paid in the development phase for the great advantages gained by the public in the growth of Commonwealth air transportation."

Profit before payment of interest	£2,012,792 (£103,875)
Interest on capital	£947,395 (£942,539)
Net surplus	£1,065,397 (−£838,664)
Provision for tax	£350,000 (nil)
Accumulated deficiency	£841,260 (£1,778,171)
Revenue	£38,361,337 (£36,156,579)
Cost per capacity ton-mile	40.1d (41.3d)
Capacity ton-miles flown	220,530,209 (208,306,550)
Load ton-miles flown	145,593,003 (136,967,414)
Revenue load factor	64.5 per cent (64.5)
Passenger-miles flown	968,814,703 (888,236,132)
Revenue seat utilization	63.5 per cent (63.6)
Revenue miles flown	33,756,716 (33,339,831)
Passengers carried	304,980 (290,629)
Excess baggage (tons)	799 (874.3)
Mail (tons)	3,366.1 (3,110.4)
Diplomatic bags (tons)	68.4 (78.3)
Commercial freight (tons)	5,408.8 (5,630)
Average passenger distance	3,143 miles (3,032)
Unduplicated route mileage	79,383 (82,403)

*Figures in parentheses are results for financial year ended March 31st, 1953.

EAGLE'S VIKING FREIGHTER

AS reported in *Flight* for September 17th, the latest Viking to be added to the fleet of Eagle Aviation, Ltd., is G-AJPH *Lord Dundonald*—formerly the experimental Nene-Viking, and recently converted to normal Viking 1B standards by Eagle Aircraft Services, Ltd. The aircraft was given a good send-off in its new life as a passenger/freight transport (it is the first British Viking to embody a large freight door) at Northolt on Friday last, when it was "launched," with ceremony and champagne, by Mr. Peter Masefield, chief executive of B.E.A.

AMERICAN LOAN FOR K.L.M.

CONCLUSION of a financing agreement between K.L.M. and two American banks has enabled the Dutch airline to repay the whole of the $7m (£2.5m) loan obtained in 1952 from the International Bank for Reconstruction and Development, Washington, in order to buy Super Constellations. When the agreement was concluded on Sept. 15th $1.4m (£500,000) had been repaid.

K.L.M. state that the attractive features of this refinancing (by the National City Bank and the Chase National Bank) is that the terms of the new loan are much better than those of the old one. The rate of interest is 3¼ per cent, compared with 4½ per cent, and, whereas the former loan was covered by a Government guarantee and a mortgage on some aircraft, the new agreement entails no special securities. The rate of interest on the latest issue of Treasury-guaranteed B.O.A.C. stock is 4 per cent, and a representative rate for a large American airline is 3¼ per cent.

BREVITIES

REPRESENTATIVES of the Scandinavian Royal families, and the Prime Ministers of Norway, Sweden and Denmark, will be among the passengers on the first scheduled trans-polar flight. A DC-6B of S.A.S. will inaugurate the route (between Copenhagen and Los Angeles) on November 15th; thereafter, there will be twice-weekly flights in each direction.

* * *

From January 1st next Mr. H. Throne-Holst will take over from Mr. Per Norlin as managing director of Scandinavian Airlines System. Mr. Norlin, whose resignation was announced last week, is expected to remain a member of the Board.

* * *

A former airport manager at Prestwick, Mr. David Livingston has returned from a tour of duty as an adviser to the Lebanese Government on the development and operation of Beirut Airport. He is expected to take up a new appointment at London Airport.

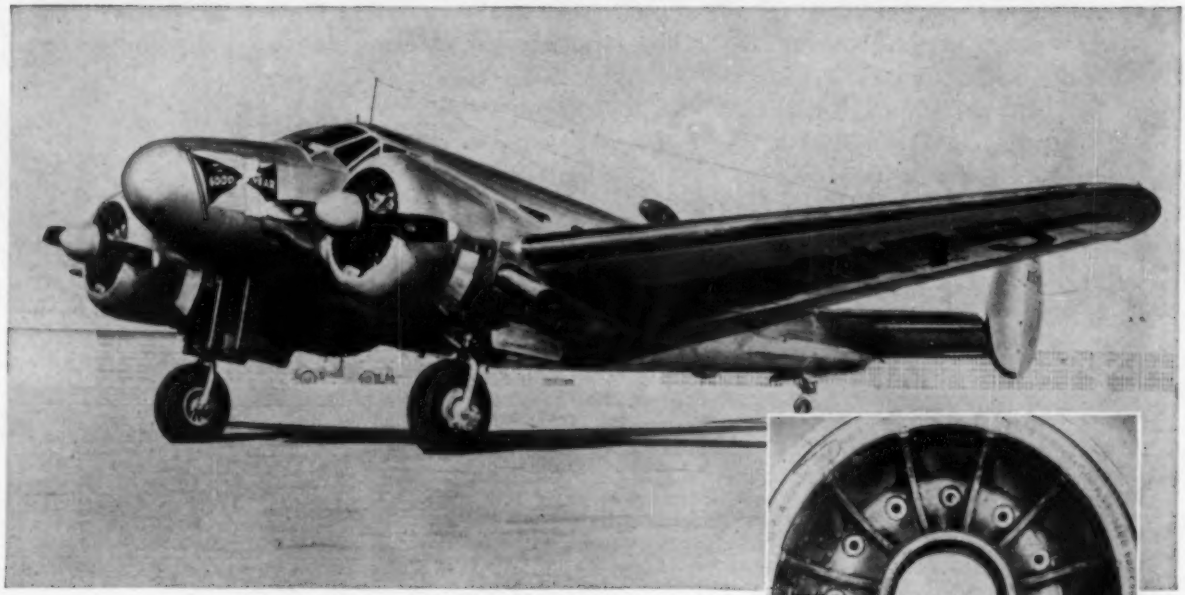
* * *

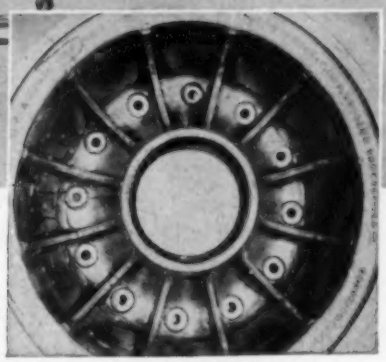
In private life a solicitor of the Supreme Court and senior partner of Beaumont and Sons, Major K. M. Beaumont has been elected chairman of the Legal Committee of I.C.A.O. for a one-year term. One of the Committee's current pre-occupations is a draft convention dealing with liability for damage done in cases of collision of aircraft in flight.

The large doors of this Super Constellation identify it as a freighter—the first of four—delivered recently to Seaboard and Western Airlines.

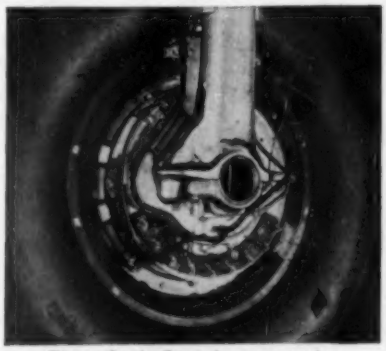
WHAT LOADS ARE ACTUALLY APPLIED ON LANDING GEARS?

To find out, we "wired" this plane for trouble!





First : Stresscoat for Laboratory Tests



Then : Strain Gauge Instrumentation for Comprehensive Flight Studies

IT had never been done before—an extensive *flight-test* study in which simultaneous recordings were made of all the component landing-gear loads affecting wheels and brakes, together with the resulting strain.

We selected one of our own fleet as the guinea pig, and ultimately put it through every conceivable type of field manœuvre during the course of 64 flights — *with strain gauge instrumentation of the gear at 135 points.*

But first, Stresscoat was used to tell us where to locate strain gauges. Then, to segregate loads the instrumented strut assembly was subjected to extreme conditions of drag, side, radial, and castering loads on special laboratory test equipment.

The results have proved the dependability of laboratory testing and have enabled us to go further, for they have opened up new knowledge concerning true service loads which was hitherto unknown.

It took two years in the doing — all because Goodyear insists on ascertaining rather than assuming the items which represent the facts of the problem, thereby helping to pioneer aviation progress.

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TRADITIONALLY, Austin Reeds have always made suits for men who prefer to be unobtrusively well-turned-out. Our cloth is specially selected from among the finest produced at famous mills and cut in the conservative style that has made British tailoring the standard of the world. What *is* noticeable in an Austin Reed suit, if you examine it closely, is the scrupulous care over small details that is the mark of the craftsman.

From among our latest 3-piece suits you can select one immediately that will fit you with made-to-measure perfection. We have single and double breasted suits in grey, blue or brown worsted and in smooth grey barathea. Prices are from 18½ to 22 gns, which is rather surprising, all things considered.

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Of Regent Street

1054 LONDON AND PRINCIPAL CITIES

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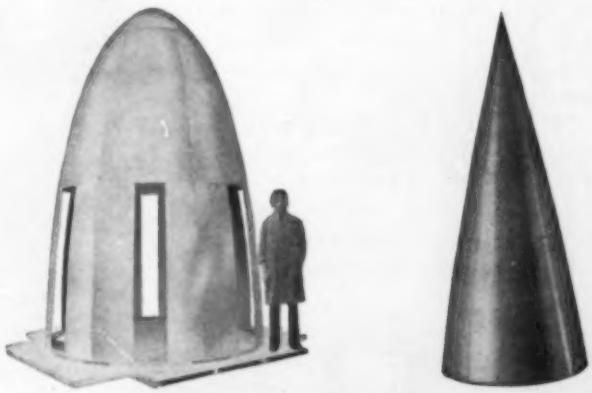
FOR AIRCRAFT AND AUTOMOBILE



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CIVIL AVIATION . . .

Airwork, Ltd., and Hunting-Clan Air Transport, Ltd., announce that from October 13th frequencies will be increased from four to six monthly on their joint Central African Safari service between London and Salisbury. Vikings will leave London every Friday and on alternate Wednesdays.

* * *

As first reported and illustrated in *Flight*, the Vickers Viscount 700 prototype was temporarily painted in the colours of Capital Airlines during July so that a film could be made for distribution in America. Capital Airlines tell us that the film is expected to be finished in mid-October and that by this means, "thanks to the co-operation of the Vickers Armstrong people, we will be able to bring the Viscount story to the American public well in advance of delivery."

* * *

An Air Ministry inquiry is being held into the accident to Scottish Airlines York G-ANRC at Stansted on September 22nd. The aircraft crashed during take-off and was burnt out, but the 45 passengers (troops bound for Fayid) and crew of five all escaped without serious injury. Contrary to some reports, engine failure was not the cause of the accident.

* * *

Aer Lingus report that since the introduction of Viscounts on their routes between Dublin and London, Paris, Manchester and Amsterdam, there has been a traffic increase of 26 per cent instead of the expected 18 per cent; of the extra traffic, it is believed that 16 per cent has been attracted solely by "Viscount appeal." By mid-summer utilization of the Irish airline's fleet of four Viscounts was equivalent to 2,000 block hours per annum, a better figure than that achieved with the DC-3 fleet. The rate of Viscount availability, 88 per cent, was about that of the DC-3s.

"Civil pilots please note! For some flights you must file a flight plan, but you can file one for any flight" is the heading—omitted from this reproduction—to the new M.T.C.A. poster mentioned below.

CLUB AND GLIDING NEWS

FORMATION pilots of the Fair Oaks Aero Club team which won the formation flying competition at the Vintage Club's Denham rally in August were Messrs. Cobbett, Mitchell, Lovegrove and Doyle. Don Doyle, a U.S. Navy serviceman and one of the keenest members of the club, is leaving the Service in order to take up commercial flying in this country, and is already well on the way to obtaining his Commercial Licence.

ACCORDING to the Ministry of Transport and Civil Aviation, many private pilots are not aware of the benefit they may receive, should they become in need of assistance during a flight, by filing flight plans, neither are they fully conversant with the rules relating to the filing of such plans. To bring the subject of flight plans to the notice of pilots, therefore, the Ministry has produced a poster (illustrated above) which is being distributed to aerodromes and flying clubs throughout the country. It is hoped that this will encourage pilots to study the relevant parts of the U.K. *Air Pilot*.

In view of the undoubted importance and value of filing flight plans, it seems a pity that more imagination has not gone into the design of the poster. While hoping for improved designs in future, those who have seen the vigorous and effective illustrations used in similar campaigns by modern American cartoonists (for the U.S. Navy, for example) can raise little enthusiasm for this particular piece of poster-work. The Ministry's object, to remind pilots of an important subject, is most commendable: the execution of the idea is regrettably poor.

SOUTH AFRICA'S Government subsidy scheme for private flying and gliding—amounting to some £25,000 per year—came into operation on September 1st. Under the scheme a newly licensed power pilot receives a £60 subsidy, with subsequent grants of £20 for licence renewals. To enable flight training schools to offer facilities to country areas as well as the cities, the ferrying of training aircraft will be assisted at the rate of 6d. per mile.

In order to qualify for a Government subsidy, flying schools must belong to a representative association approved by the Minister of Transport: to date, these comprise the Aero Club of South Africa and the Commercial Aviation Association. These approved organizations, which accept responsibility for training standards and subsidy administration, themselves receive a grant of £1,500 per year.

Gliding is now officially encouraged in a similar manner: clubs (again belonging to approved organizations) are to receive £1,200 each for the first year, and £1,000 for each successive year. This is intended mainly to assist the gliding clubs to obtain much-needed technical and instructional equipment. The Government has accepted the principle that the entire subsidy scheme should be operated for an initial period of five years.

Strictly speaking no club scene, but an example of prop-swinging—certainly more usual these days at the clubs than elsewhere—at Hendon. The pilot/swinger is Neville Duke, the machine the Hawker Tomtit, and the occasion the R.A.F. "At Home" day during Battle of Britain Week.

THE INDUSTRY

A Shoreham Appointment

THE appointment is announced of Mr. Eric John Niedermayer as chief technical officer to F. G. Miles, Ltd., of Shoreham Airport. Mr. Niedermayer, who is 38 years of age, has been a member of the Miles design team since 1938, when, as an R.Ae.S. graduate, he joined the stress office at Woodley. During the war he served with the Army, attaining the rank of major and eventually being seconded to the Ministry of Supply for technical liaison duties. On demobilization in 1946 he rejoined F. G. Miles as a project stressman, working on such aircraft as the Marathon and Merchantman. In 1948 he transferred to the works of Handley Page (Reading), Ltd., becoming assistant chief stressman. He returned to the Miles organization in 1952 as chief stressman, to work on, among other things, the conversion of the Sparrowhawk into the Sparrowjet. In his new position, state F. G. Miles, Ltd., "he will have in his charge a number of interesting new projects."

Mr. Niedermayer.

Economical Building Construction

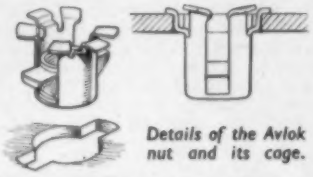
AMONG buildings recently erected by means of the "Unimer" system of construction is a cargo unit and customs shed for B.E.A. at London Airport. This system of building makes use of standard components in tubular steel. Conforming to British Standards Specification 449, these parts comprise trusses, purlins, gable frames, columns and sheeting rails, which make use of a combination of welded and bolted joints. The various components require little more than ⅜in and 1in spanners and a pipe wrench for assembly, and another advantage claimed for the system is that the standardized method of construction makes it simple to extend existing "Unimer" buildings.

The buildings are so designed that, depending on the purpose, wall in-filling can be of asbestos sheeting, brickwork or concrete blocks. Roof lighting, by means of patent glazing, deadlights or Perspex sheets, can be incorporated with the asbestos-clad roof, and side lighting by various methods may be arranged.

"Unimer" buildings are described as "one of the most competitively priced in the building industry" and there is a special distribution system by which stockists in various parts of the country maintain a complete range of tubular steel components and other materials required; erection of a building in any area can therefore be quickly put in hand. Details are obtainable from United Merchants, Ltd., 418 Strand, London, W.C.2.

New Blind Anchor-nut

SEEN in this country for the first time at the Farnborough Show was an ingenious blind anchor-nut, the invention of M. Launay, who until recently was on the engineering staff of Air France. It was exhibited by Aviation Developments, Ltd., of 229-231 High Holborn, London, W.C.1, who have secured British Commonwealth and certain European manufacturing rights.



Details of the Avlok nut and its cage.

Known as the "Avlok," the device consists of a two-eared nut retained in a spring-steel cage of the shape shown in the accompanying drawing. The drilled hole in the work-surface, of sufficient diameter to accommodate the cage, is modified by having two diametrically opposed slots cropped from its edge by a special tool. The cage is inserted in the hole, the slots allowing the eared nut to pass through. The cage is then given a quarter turn, so that two of its bars, which are outwardly bent, engage in the slots, so preventing the cage —and thus the nut—from turning.

It will be seen that the Avlok is a true blind nut, in that no attachment of any kind need be made in advance on the blind side of the hole. It is being marketed initially in 2 B.A., ¼in B.S.F. and ¼in Unif thread sizes.

IN BRIEF

Bowden (Engineers), Ltd., of Willesden Junction, London, N.W.10—the manufacturers of Bowden wire mechanisms and Bowdenflex flexible-pipe units—have appointed Mr. J. G. McLeod, A.M.I.W.M., A.M.Inst.B.E., to be works manager at their Willesden factory.

* * *

Now performing liaison duties for Teddington Controls, Ltd., at their London office, 51 Brompton Road, S.W.3, is Lt-Cdr. (A) (AE) H. A. W. Harding, R.N.V.R. He had previously served for sixteen years with B.O.A.C. and is an air engineer officer with the Channel Air Division, R.N.V.R.

* * *

Mr. W. A. Hartop, works director of George Kent, Ltd., left England on September 9th for a two-month stay with the company's subsidiary in Canada, Kent-Norlantic, Ltd., Horner Avenue, Toronto. Main object of his visit is to assist the production organization of Kent-Norlantic towards full operation, and to investigate further valuable export prospects.

* * *

In last week's article entitled "Ground Radar and Radio" the introductory reference to D.M.E. should have read: "In the United States the system is in conflict with the military system of TACAN; in Australia a non-standard 200 mc/s equipment, and in the United Kingdom another 200 mc/s equipment, incompatible with the Australian equipment, is being produced to meet the needs of B.O.A.C. on its overseas routes, and especially for jet operation."

* * *

Racal Engineering, Ltd., of Bracknell, Berks, announce that Mr. M. I. Forsyth-Grant, A.M.I.E.E., has resigned from International Aeradio, Ltd., with whom he was chief engineer, and has accepted an invitation to join the Racal Board. It is also announced that Mr. D. W. Morrell, B.Sc.(Eng.), A.M.I.E.E., who has been sales manager of Racal for the past 18 months, has also been appointed a director; and that Mr. J. E. Scatcherd, LL.B., has joined the Board as financial adviser.

BATTLE ROYAL (Continued from page 511)

but at present-day speeds an enemy pilot would be lucky even to spot an F.R.9 at low level, and to make a pass could be a chancy undertaking. A sister squadron of No. 2, however, continues to favour sections of two. Another point of controversy is whether a Tac.R. aircraft should continue its sortie if intercepted.

Some Meteors of No. 2 Squadron have lately been fitted with wire recorders, and these were to be given their first real test in Battle Royal. With this installation the pilot speaks into his microphone as usual, and the reel is played-back at base.

The Meteor 9 is highly regarded in 2 Squadron. To the pilots the dual power plant means a great deal, and servicing is easy. With the ventral tank, but without under-wing tanks, a typical sortie would be of an hour's duration. The C.O. assured us that sustained flying at 350-400 knots at very low level, and often through violent bumps, is rough on airframes.

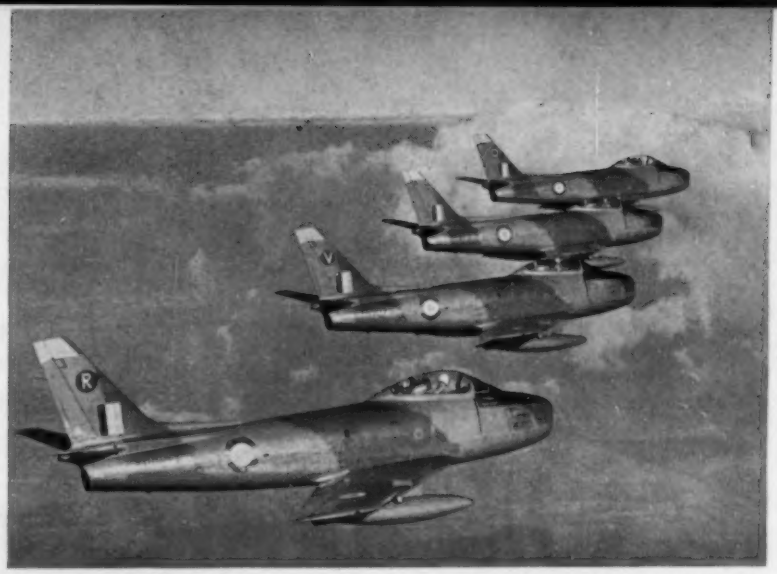
Operating as one flight of No. 2 Squadron was a detachment of Belgian F-84Gs, commanded by Capt. Hubert; but good as these are, one gathered that they do not equal the Meteor's reputation in the Tac.R. rôle—from which we now turned our attention to the "P.R.", or high-altitude photographic reconnaissance.

We learned at P.R. Ops. that the Meteor P.R.10s of No. 541 Squadron (S/L. Thompson) had flown three sorties with little result, for cloud base had been anything from 2,000ft to 3,000ft. One pilot, detailed to photograph a suspected headquarters area, and finding it covered eight-eighths, nipped down from 16,000ft and found the H.Q. visually. The concealment of a mobile field hospital had been checked, but defence positions along the River Lippe remained to be covered.

Here we leave Battle Royal in its opening phase. Much remains to be told next week of the later activity and of visits to Venom and Sabre wings. And, having regard to Air Marshal Broadhurst's valuation of reconnaissance, we shall have more to say on that "supremely important" matter.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News



High cover for 2nd A.T.A.F. squadrons is provided by wings of Sabres, typical of which is that which flies from Brüggen (station commander, G/C. W. V. Crawford-Compton, D.S.O., D.F.C.). The wing was active in Exercise Battle Royal (see pages 510-511) but, having been stood down for a day, put up this formation of "hard-winged" Sabres for "Flight's" photographer.

Exercise "Morning Mist"

THIS year's principal NATO sea/air exercise, code-named "Morning Mist," began on September 23rd and will end on October 3rd. Sponsored by SACLANT, SACEUR, CINCCHAN and CINCMAIRCHAN,* the exercise is under the operational direction of CINCEASTLANT, Admiral Sir Michael Denny, CINCNORTH, General Sir Robert Mansergh, and CINCMAIRCHAN, Air Marshal Sir John Boothman. The latter is, of course, also CINCAIREASTLANT and A.O.C-in-C., Coastal Command. For this exercise he wears these "three hats" operationally. General Mansergh, CINCNORTH, has delegated the operational control in his sector to a task-force commander, Norway; Flag Officer, Denmark; and Flag Officer, Norway.

Although equivalent in importance to its predecessors, "Mariner" and "Mainbrace," "Morning Mist" involves fewer ships and aircraft, and is divided into a series of phases designed to exercise certain aspects of NATO commands, communications and operational techniques. These phases were each given a separate code-name.

"Polar Mist," September 26th-29th, entailed the movement of a blue (NATO) Norwegian Army brigade southwards from the Troms area to Trondheim. Orange forces attempted to disrupt the movement, which had of necessity to be made partly by sea. R.A.F. Shackletons, a Royal Marine amphibious raiding party, a cruiser and two destroyers took part.

The "Northern Mist" phase continues throughout the exercise under the command of Flag Officer, Norway, and Flag Officer, Denmark. It is principally a convoy exercise in the North Sea and Skaggerak areas, and R.A.F. Shackletons taking part in it are detached to Sola, near Stavanger.

"Scandic Mist" took place in the Western Baltic, extending as far as 17 deg east. Blue forces were under the command of Flag Officer, Denmark, and the Admiral, Danish Coastal Fleet. Main activity was in anti-submarine and anti-mine operations. The two British destroyers taking part did not go farther east than Bornholm. Concurrently with these three phases, national air exercises were being held in Norway and Denmark. Canberras and Lincolns of R.A.F. Bomber Command, Varsities of Flying Training Command and aircraft of the United Kingdom-based 49th Air Division, U.S.A.F., acted as attackers in these exercises; many of them continued from Norway to targets in Germany in Exercise Battle Royal.

Two further phases of "Morning Mist" were centred in the Biscay and Channel areas, and were called "Bay Mist" (September 23rd - 30th) and "Channel Mist" (September 30th-October 3rd). These phases were principally concerned with convoy movements in both open and confined seas, and token convoys made up of small groups of fleet auxiliaries sailed out into the Atlantic and back again and plied between southern England and western France. Air patrols and surface anti-submarine forces were engaged, as was the Royal Dutch Navy carrier *Karel Doorman*.

No overall strategic concept governed "Morning Mist." The various phases were the annual fully manned exercising of the command system, and a large number of reservists were recalled to take their places for action and to practise their operational duties. Altogether, 116 maritime aircraft are taking part on both sides, this number being trebled when Training and Bomber Commands join in. Some 50 to 60 ships of the six nations are involved, including nine submarines on the Orange (enemy) side. The possibilities of atomic warfare have been taken into account, and it is not to be excluded that a complete operations centre should be wiped out.

**NATO code-names for commands: SAC = Supreme Allied Commander; CINC = C-in-C.; COM = Commander; AIR = Air Forces; MAIR = Maritime Air Forces. Regions: LANT = Atlantic; EUR = Europe; CHAN = Channel. The Atlantic is divided into a series of sub-area commands, e.g., Eastlant, Bisclant, Centlant, Norlant, etc.*

Air Marshal Sir John Boothman and Admiral Sir Michael Denny discuss Exercise "Morning Mist" at their operational H.Q. near London.

A.V-M.' Beamish's Tour

HAVING left Lyneham, Wilts, by Hastings last month, A.V-M. G. R. Beamish, A.O.C-in-C. Transport Command and Inspector General of Air Transport Services, is now in Australia.

He is on a 25,800-mile flight inspecting the airfields and stations used by Transport Command in the Middle East, Far East, Australia and the Pacific. He is expected back at Lyneham on October 19th.

One of A.V-M. Beamish's last duties before leaving Britain was to present a newly approved badge to No. 167 Squadron at R.A.F. Benson. It was received by the C.O., S/L. H. D. Byrne.

The unit is at present engaged on overseas ferry duties, having been formed out of a nucleus from No. 1 Overseas Ferry Unit in January 1953.

Three New R.A.F. Appointments

CONSEQUENT upon the appointment of A. Cdre. H. J. G. E. Proud as Provost Marshal at the Air Ministry, his post as A.O.C. No. 67 (Northern Ireland) Group and Senior Air Force Officer in Northern Ireland has been taken over by A. Cdre. G. W. Hayes, O.B.E., Director of Manning at the Air Ministry.

The new Director of Manning is G/C. F. A. Pearce, C.B.E., with the rank of Air Commodore. G/C. Pearce has been serving with the directing staff of the R.A.F. Staff College, Bracknell, Berks.

Grant Dalton Trophy

THE Grant Dalton Trophy for 1953-54 has been awarded to No. 3 (Canterbury) Territorial Fighter Squadron, R.N.Z.A.F.

SERVICE AVIATION . . .

Runners-up were No. 1 (Auckland) with No. 2 (Wellington) third and No. 4 (Otago) fourth.

Originally an award for a cross-channel yacht race in 1866, the Grant Dalton Trophy was presented to the R.N.Z.A.F. by W/C. G. Grant Dalton, R.A.F., when he was Director of Air Services from 1929 to 1931.

It is competed for annually by the four Territorial Fighter Squadrons and is awarded for highest points gained in flying, bombing, gunning, instrument ratings, small arms and general efficiency.

Shackletons Return Home

ON Tuesday last four Shackletons of No. 206 Squadron were due to return from their 40,000-mile goodwill and training tour of the Far East, during which they took part in maritime exercises in the Indian Ocean (operating from Negombo in Ceylon) and paid visits to various towns and training establishments in Australia, New Zealand and Fiji.

The detachment was commanded by G/C. R. Faville, C.B.E., the Station Commander at St. Eval, Cornwall, where No. 206 Squadron (S/L. J. D. Beresford) is based. Each of these officers captained an aircraft, and F/L. R. S. Salmon and F/L. A. E. M. Barton the remaining two. Altogether the detachment comprised some 100 officers and airmen, including the personnel carried in the two supporting Hastings aircraft.

Naval Engineering Co-operation

THE Engineer-in-Chief of the Fleet, Vice-Admiral (E) F. T. Mason, C.B., is at present visiting Canada at the invitation of the Canadian Naval authorities.

Later, Admiral Mason is to spend a further month discussing material problems with the U.S. Naval authorities. Subjects will include the future development of the British-invented steam catapult.

Against a background of a D.H. Vampire T.11 of No. 22 (City of Sydney) Squadron, Marshal of the R.A.F. Sir John Slessor (right) chats with the Australian C.A.S., Air Marshal J. P. J. McCauley, during his recent visit to Australia for Air Force Week.

The Shackletons of No. 206 Squadron, R.A.F., during their recent visit to the Royal Australian Air Force base at Richmond, New South Wales. (See "Shackletons Return Home," this page.)

N.Z.-Japan Transport Service

TO carry K-Force replacements and repatriated men between New Zealand and Japan, No. 41 Squadron R.N.Z.A.F. has instituted a new courier service formerly undertaken by T.E.A.L. and Qantas Airways. The first aircraft on the new service was a Hastings captained by F/L. K. B. Smith.

The route flown was re-surveyed recently by a Dakota; it is one that was used just after the war, when a service was flown to support No. 14 (Fighter) Squadron R.N.Z.A.F., then on occupation duties in Japan.

No. 41 Squadron already operates between New Zealand and the United Kingdom and supports No. 14 Squadron, now based on Cyprus. Frequent flights, by Bristol Freighter, are also made to Fiji, where No. 5 (Maritime) Reconnaissance Squadron is based, operating Sunderlands.

Kemsley Trophy

A ROCKET-FIRING competition for the Kemsley Trust Flying Trophy is due to take place at R.N.A.S. Brawdy, Pembrokeshire, on Saturday and Sunday, October 2nd and 3rd. Six R.N.V.R. teams are taking part. Present holders are No. 1831 Squadron.

R.C.A.F. Operation Manitoba

RESCUE teams from the R.C.A.F. Communications and Rescue Flight at Winnipeg, and from the U.S.A.F. Air Rescue Squadron at Lowry A.F.B., Denver, Colorado, held a combined four-day rescue exercise at Atikameg Lake, beginning on September 7th. The scheme of the exercise was that a hypothetical Canadian pilot with an American passenger was lost between Churchill, Man., and The Pas. The two rescue units then combined in operations from Winnipeg. Para-rescue personnel were ready to jump at the scene of the "crash" and an airlift was organized to evacuate survivors.

R.A.F. Rowing Regatta

HELD at Wallingford, Berks, on September 15th the R.A.F. Rowing Club's regatta attracted the biggest number of entries of any R.A.F. regatta to date. Oarsmen from 24 stations and units in England and Wales took part. The Inspector-General of the R.A.F., Air Marshal Sir Charles Guest, president of the R.A.F.R.C., was present, and Lady Guest gave away the prizes.

Acting as host was G/C. A. G. Dudgeon, who commands Benson, and he had the satisfaction of seeing his own unit tie with Abingdon for the Scott Paine Cup. Two coach-loads of patients from the R.A.F. hospital at Chessington were accommodated on the riverside lawns.

Results:—*Senior Fours:* 1, Cardington; 2, 90 Group, Medmenham (three-quarters of a length; time, 3 min 12 sec). *Senior Sculls:* 1, P/O. G. Serrell (Benson); 2, S.A/C. Clark (H.Q. Maintenance Command) (4 lengths, 3 min 42 sec). *Junior Fours:* 1, Henlow; 2, Moreton-in-Marsh (half a length, 3 min 34 sec). *Novice Fours:* 1, Abingdon; 2, Nuneham Park (one length, 3 min 55 sec). *Junior Sculls:* 1, L. A/C. Hall (North Weald); 2, Cpl. Johnson (Upavon) (one length). *Novice Sculls:* 1, L. A/C. Kitchener (Benson); 2, Cdt. Plt. D. H. Taylor (University of Birmingham Air Sqn.) (two lengths, 4 min 42 sec). *Veterans' Sculls:* 1, G/C. H. R. A. Edwards; 2, S/L. C. Jordan (three-quarters of a length).

Reunions

THE seventh annual reunion of No. 166 Squadron and its associated station Kirmington is due to take place on Saturday, October 16th, at 1830 hr. The venue is the Star and Garter, Poland Street, London, W.1. Tickets (12s) from F. C. Tighe, 31 Mayo Road, Sherwood Rise, Nottingham.

* * *

No. 4 Naval Fighter Wing's annual reunion will take place at the Villa restaurant, Gerrard Street, London, W.1, on Saturday, November 6th. Details from Cdr. G. C. Baldwin, R.N., Walnut Tree Cottage, Westergate, Chichester, Sussex.

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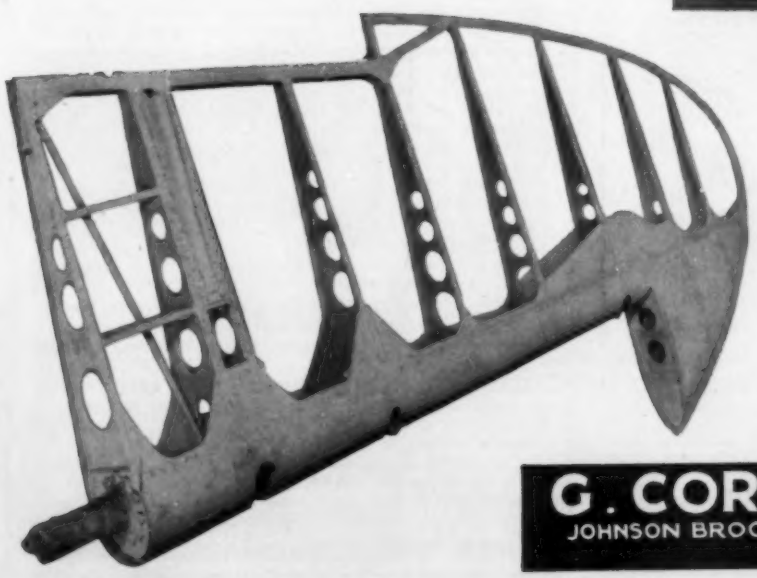

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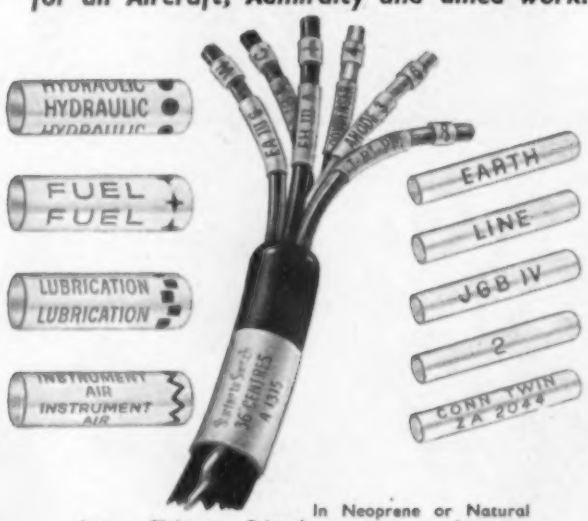

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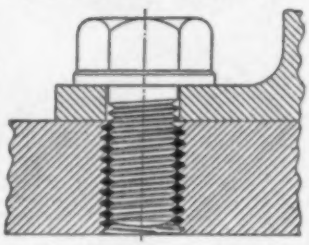

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FROM B.K.S. Air Transport, Ltd., of Dorset House, Old Burlington Street, London, W.1. Application No. 366 for a U.K. internal service with Dakota aircraft for the carriage of passengers, supplementary freight and mail between Leeds (Yeadon) and Belfast (Nutts Corner), at a frequency of from one to seven services weekly initially during the season from April to October inclusive each year for a period of seven years from May 1st, 1955.

APPLICATION No. 367 for a U.K. internal service with Dakota aircraft for the carriage of passengers, supplementary freight and mail between Leeds (Yeadon) and Southend at a frequency of from one to seven services weekly initially during the season from April to October inclusive for a period of ten years from May 1st, 1955.

APPLICATION No. 368 for an inclusive tour service with Dakota aircraft, in conjunction with Roberts' Tours, Ltd., for the carriage of passengers and supplementary freight between Newcastle (Woolsington) and Belfast (Nutts Corner), at a frequency of one service per week increasing further with traffic demand initially during the season from April to October inclusive each year for a period of seven years from May 1st, 1955.

APPLICATION No. 370 for a normal scheduled service with Dakota aircraft for the carriage of passengers, supplementary freight and mail between Southend and Amsterdam at a frequency of from one to 14 services weekly initially during the season from April to October inclusive each year for a period of seven years from May 1st, 1955.

APPLICATION No. 369 from British European Airways, of Keyline House, Ruislip, Middlesex, for permission to carry passengers and supplementary freight on their positioning flights with Bristol 170 Westland S.55 and comparable types of helicopter aircraft between Gatwick on the one hand and other aerodromes in the London area served by B.E.A. on the other hand.

APPLICATION No. 99/2 from Starways, Ltd., of Liverpool Airport, Liverpool 19, for permission to continue to operate their inclusive tour service between Liverpool (Speke) and San Sebastian (Application No. 99), which has been approved by the Minister of Transport and Civil Aviation for the period up to September 30th, 1957, via the airport at Biarritz instead of the airport at Bilbao for the remainder of the period of approval.

THESE applications will be considered by the Council under the terms of reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to these applications must be made, in writing, stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [2653

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INDEX TO ADVERTISERS

	Page
Airwork, Ltd.	18
Alvis, Ltd.	17
Armstrong Siddeley Motors, Ltd.	16
Armstrong Whitworth Aircraft, Ltd., Sir W. G.	Cover i, 26
Blackburn and General Aircraft, Ltd.	3, 32
Bramah and Co., Ltd., J. R.	7
Bristol Aeroplane Co., Ltd., The	29, Cover iv
British Messier, Ltd.	13
Brooklands Aviation, Ltd.	29
Brown and Co., Ltd., E. G.	24
Brown Corporation (Sales), Ltd., David, The	20
Central African Airways Corporation	32
Cossor, Ltd., A. C.	19
Corner and Co., Ltd., G.	25
Cross Manufacturing Co. (1938), Ltd.	28, 29
Dunlop Rubber Co., Ltd.	12, 31
English Electric Co., Ltd., The	21, 26, 31
Fairey Aviation Co., Ltd., The	15
Ferry Airports, Ltd.	31
Gloster Aircraft Co., Ltd.	30
Goodyear Tyre & Rubber Co. (Gt. Britain) Ltd., The	23
Gosheron and Co., Ltd., John	4
Greenwood, Ltd., P. W.	4
Handley Page, Ltd.	30
Handley Page (Reading), Ltd.	31
Hawker Aircraft, Ltd.	31
Hobson, Ltd., H. M.	2
Hymatic Engineering Co., Ltd., The	29
Ilford, Ltd.	5
I.V. Pressure Controllers, Ltd.	31
Kelvin and Hughes (Aviation), Ltd.	Cover ii
Lewis, Ltd., D.	27
Lucas (Gas Turbine Equipment), Ltd., Joseph	9
Marconi's Wireless Telegraph Co., Ltd.	11
Martin-Baker Aircraft Co., Ltd.	32
M.L. Aviation Co., Ltd.	28
Muir and Adie, Ltd.	28
Murex Welding Processes, Ltd.	6
Nomalair, Ltd.	22
National Institute of Engineering Technology	27
Opperman, Ltd., S. E.	6
Peto and Radford	14
Plessey Co., Ltd., The	10
Reed, Ltd., Austin	24
Robinson and Co. (Gillingham), Ltd., L.	6
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Rollason, Ltd., W. A.	27
Sangamo Weston, Ltd.	25
Short Brothers and Harland, Ltd.	1
Siegrist-Orel, Ltd.	26
Simmonds Aerocessories, Ltd.	Cover iii
Staravia	28
Teddington Controls, Ltd.	4
Wilson and Sons (London), Ltd., W.	20
Wolverhampton Aviation, Ltd.	27

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high limit, low limit, high limit, low limit..

. . . how long does this go on? It went on for several weeks while we were putting the Nyloc through the Cold Flow test. We repeatedly transferred it from high limit to low limit bolts, testing the torque value all the time. The results showed the remarkable powers of recovery of the nylon insert, and how well it grips the thread of different bolts. The bolt makes its own way through the insert and the material moulds itself round the thread. There's no loosening effect from normal thread tolerances. In fact the only thing that moves a Nyloc is a spanner!

We have decreased the overall height and weight of the Nyloc without affecting its thread length and screwing torque. The nut is easier to use in restricted spaces.

The Nyloc Cap Nut has an insert and cap in one integral moulding. Used with a 'Dowty' Seal it gives a leak-proof seal suitable for use on pressurised cabins and fuel tanks.

Nyloc Stiffnuts

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